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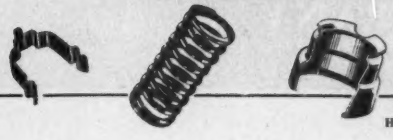

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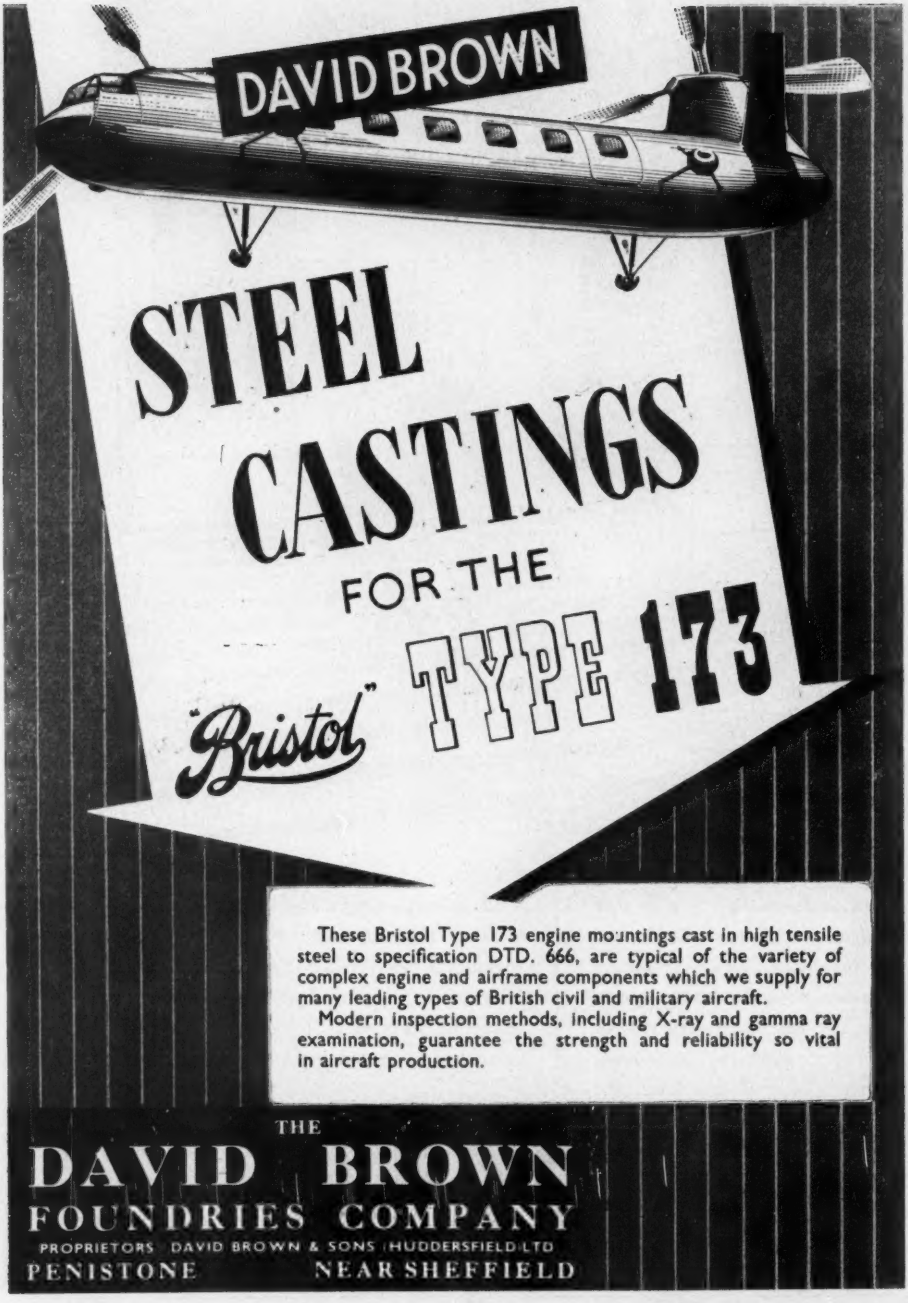
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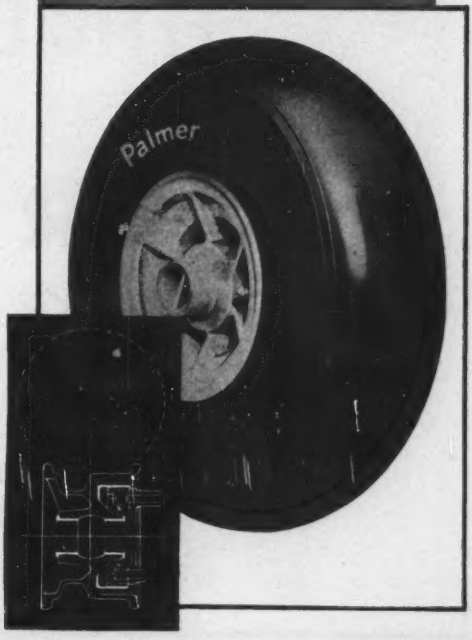

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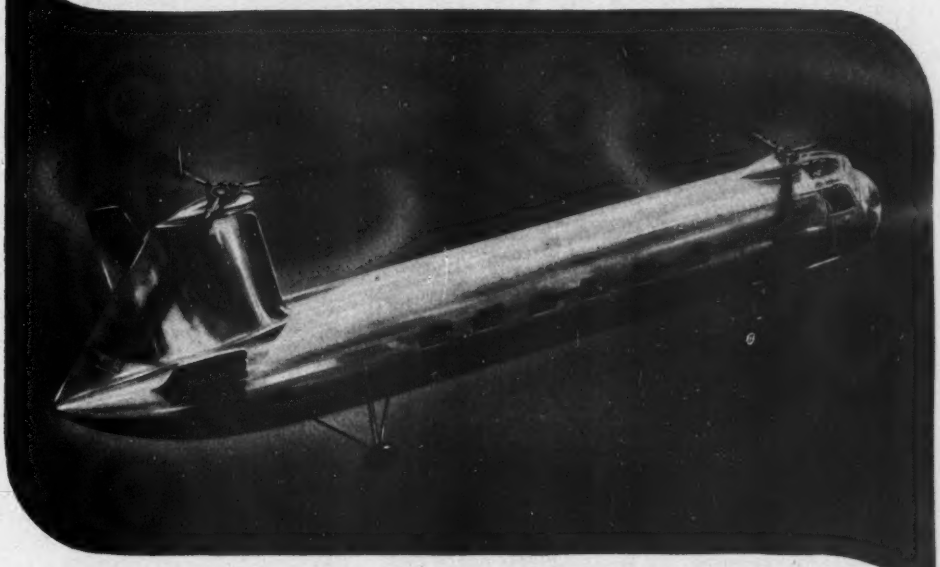

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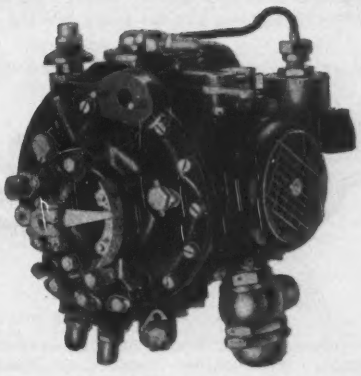

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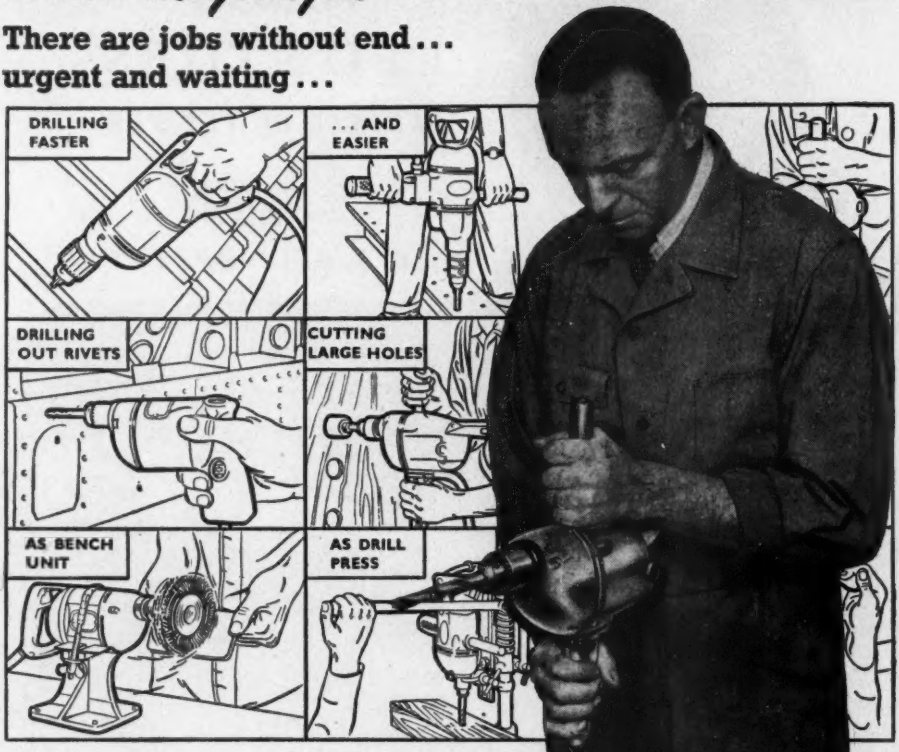

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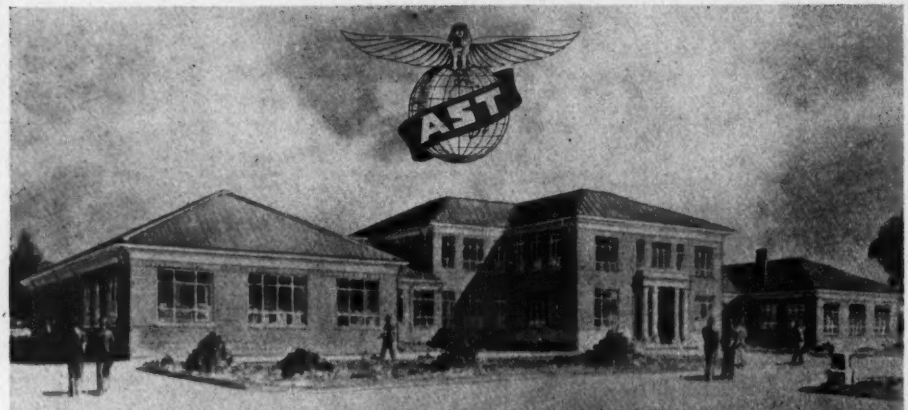

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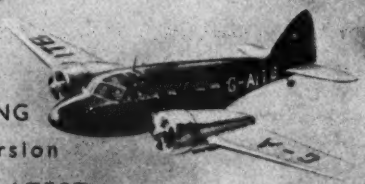

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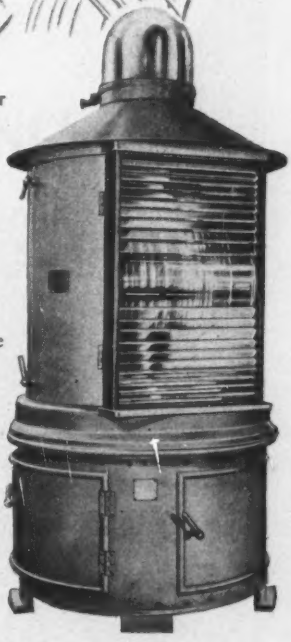

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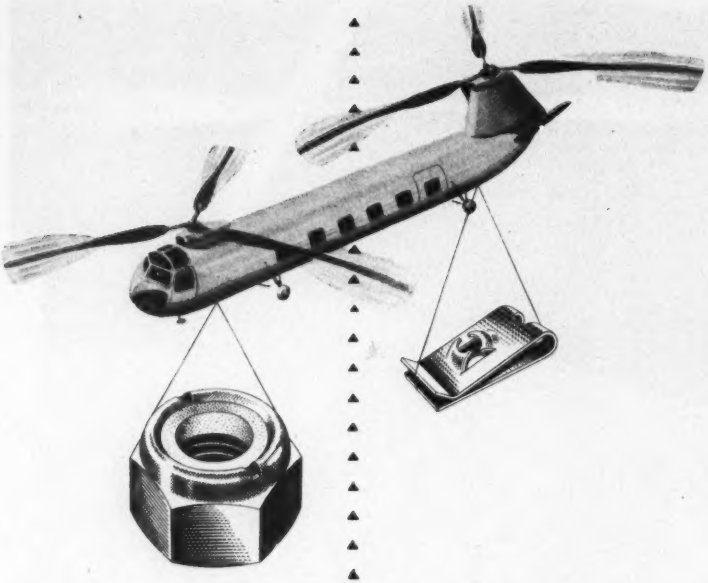

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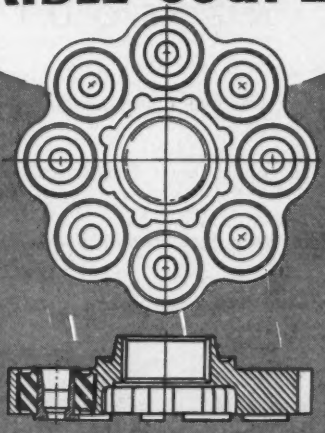

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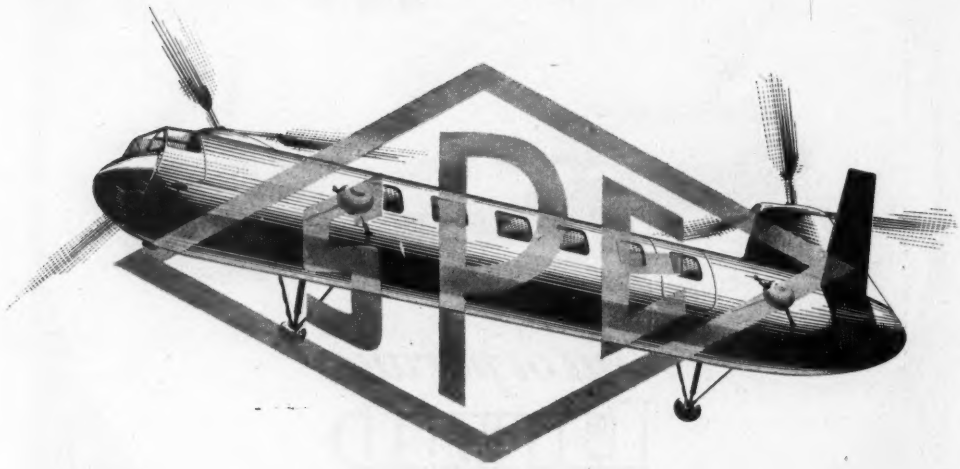

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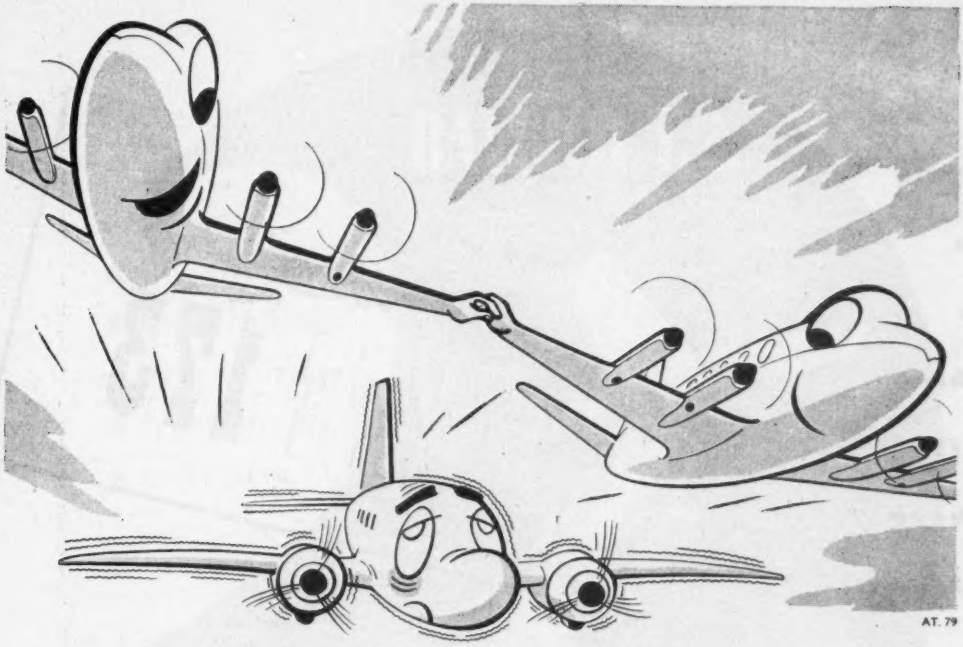

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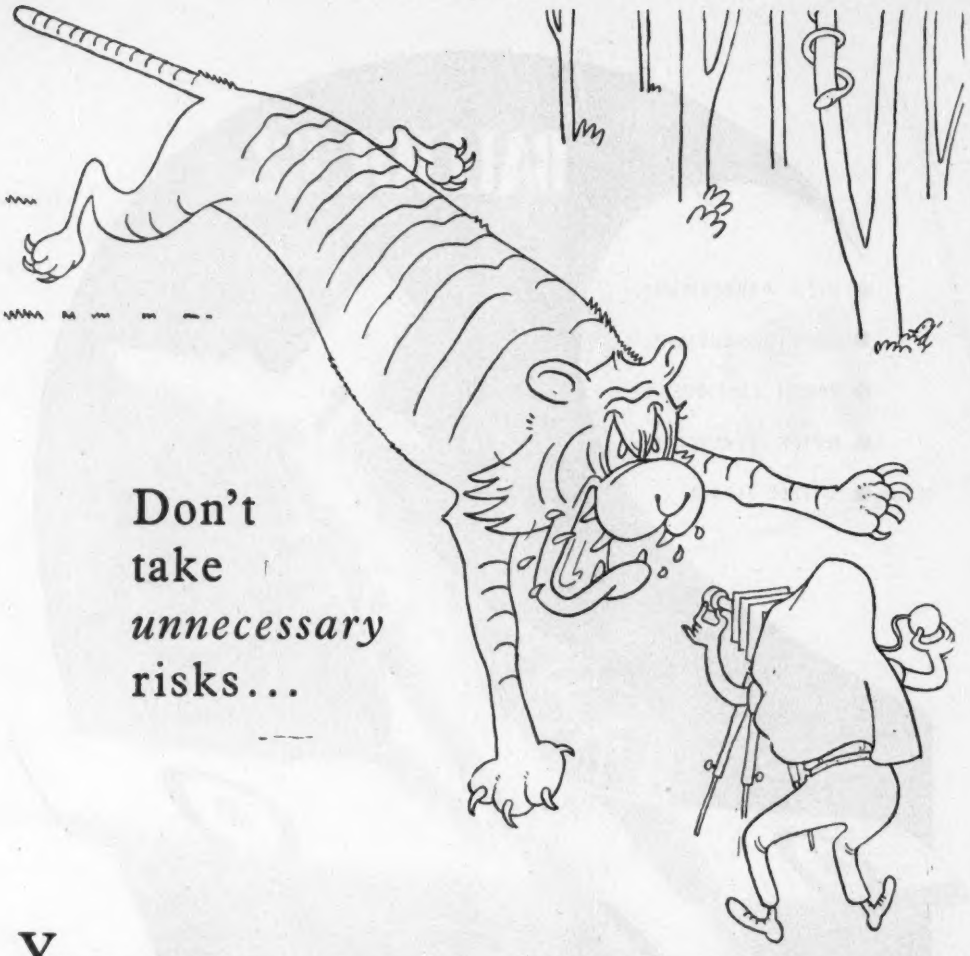

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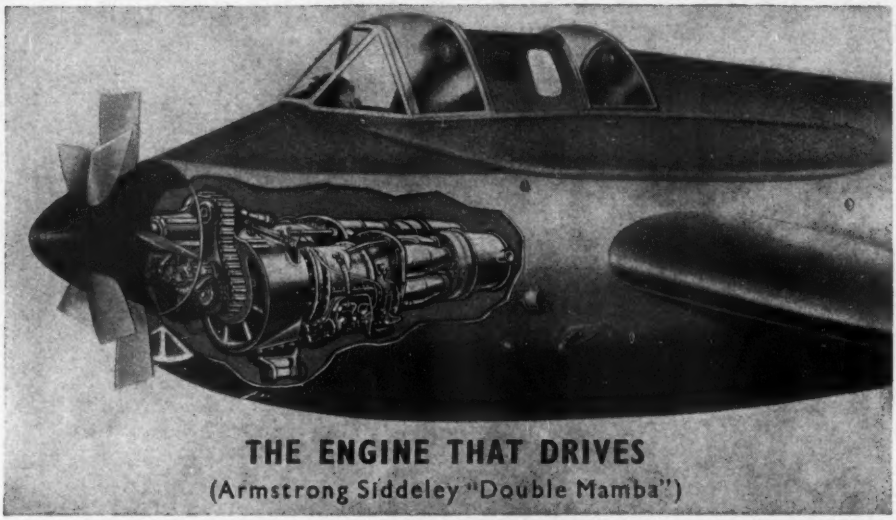

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Late Starters

IN his long statement on the condition of the R.A.F., which served to introduce the latest Air Estimates (reviewed elsewhere in this issue), Mr. Henderson, the Air Minister, did succeed in giving some reassurance—in fact, the most on such an occasion since the war—but he left it clear that the major effort, upon which a start has at last been made, has come at the eleventh hour. As a result, until this new rearmament drive gains momentum and starts to bear real fruit, some two years from now, there will continue to be alarming deficiencies in our defences.

Mr. Aidan Crawley (Under-Secretary of State for Air) sought to claim credit for the present timing of the country's expansion, admitting at the same time that there was a good deal of luck as well as judgment in the matter. We hope that the guess or gamble will prove to have been correct, but to many observers any plan indicative of foresight during this last three years has been very hard to detect; rather does the vehicle of State seem to have bounced from one near-disaster to another—with the Air Force and its equipment, until recently, jolting helplessly in the rumble seat. However, at last money has been allocated and a lead given to the aircraft industry, who may be relied on to tackle their production orders with all speed.

Considerable credit is due to those who have reorganized the R.A.F. from its post-war doldrums into an efficient force now expanding smoothly under the impetus of new pay arrangements, a new trades structure and the first trickle of new equipment.

In the debate which followed the Minister's statement, a tremendous amount of ground, including side-tracks, was covered. Among the most important subjects singled out for comment by several members was the absence of a British fighter with swept wings or capable of a speed similar to that of the Mig-15—hence, one may assume, the F-86 negotiations. Readers will remember *Flight's* three-year-old campaign in connection with the speed of fighters.

The continued absence of jet replacements for the near-obsolete aircraft flown by Bomber Command was another general lament. Here again we must look to America for some two years or more until the first four-jet bomber—ordered before it has flown—can be delivered to the R.A.F. Naturally the Canberra light bomber and its American order were the subjects of well-merited joicireng.

Much was also said about flying-boats, including the Princesses; apparently a new project is under consideration. It would be little short of disastrous to allow flying-boats—alone capable of certain important duties—to fade out of the Services altogether.

Considering the technical nature of radar and electronics, references to this aspect were frequent. The country's radar defences are being overhauled and better manned, but of airborne radar equipment little was mentioned save in connection with general re-equipment plans. In our opinion, the apparent absence of A.I. equipment for fighters and "blind" sights for bombers is as serious as the lack of new types of fighters and bombers to carry them.

Few will dispute Mr. Crawley's statement, referred to above, that the timing of production orders for expansion is partly a matter of luck, though such decisions must be taken frequently, over less important issues, by every competitive manufacturing company in the world; and the directors of these companies prefer to think judgment plays at least as large a part in timing the market and maintaining continuity of production.

A. Cdre. Harvey asked where the money voted in the last 5½ years had gone to. It may be accepted, we feel, that it has been possible to authorize only limited aircraft production during that period, but why has not the development of prototypes been pushed forward with much greater urgency? And why only a mere one or two of each experimental aircraft type, with the risk that a single one lost would seriously delay development and when extra ones up to a dozen or more would have greatly speeded the work? Barely a year ago some of the few contracts to be given were, regrettably, cut back. Development was thus slowed down, the efforts of many firms in the aircraft industry disrupted, and anxiety caused among their workpeople. We must now order virtually from the drawing-board instead of selecting as a result of experience with prototypes.

THE AIR ESTIMATES

Minister's Statement and the Debate: £1 Million a Day for the R.A.F.

IN the House of Commons on Tuesday, March 6th, Mr. Arthur Henderson, Secretary of State for Air, opened his statement on the Air Estimates, 1951-52, by reviewing the total monetary provisions to date for the period. Some high ights of his statement and of the debate (particularly those concerned with aircraft) appear, for quick reference, on page 310. Mr. Henderson said that the Air Estimates for 1951-52 were for a net total of £328¾ million. This was an increase of £105¾ million on the provision made in the original estimates for 1950-51, excluding the Supplementary Estimate of £10 million recently presented. There was, therefore, a net increase of £95¾ million. The estimates themselves were based on the £3,600 million programme which was drawn up last summer and did not provide for the additional expenditure that would result in 1951-52 from the further measures recently announced by the Prime Minister for the acceleration and increase of the defence effort. A supplementary estimate to provide for expenditure on these measures would be presented in due course.

We had embarked, said Mr. Henderson, on the most exacting expansion programme for the Royal Air Force that had ever been undertaken in peace; and, as the Minister of Defence had told the House, air strength had been given the first priority in our defence system. Of the sum allocated to the Forces under the new three-year programme, over one-third would be spent on the R.A.F.

By 1953-54 the Air Estimates might be the largest single element in the defence budget. This had never been the case in our history, in peace or in war.

Under the present programme, expenditure on the R.A.F. would average over £400 million a year. Allowing for the change in the value of money, this was double the pre-war figure. The strength of the force might rise from 215,000 allowed in last year's Estimates to over 300,000.

The quality of a relatively small number of aircrew in the squadrons determined whether the work of several hundred thousand men and women in the Forces and in the factories was well used or thrown away. As a result of the steady effort of the last few years, the R.A.F. to-day was in excellent shape to undertake a major expansion. Standards of skill were high, the organization was working smoothly, and the force had confidence in itself.

The studies in operational technique which had been the task of the C.F.E. and the Flying College, and the collective training of the operational squadrons themselves, had borne fruit in producing a very high level of confidence among flight and squadron commanders on whose ability the maintenance of quality in the expanded forces would so largely depend. The present front-line strength of the R.A.F. was more than half as great again than it was when Air Estimates were presented in March, 1948.

Under the expansion programme there would be a large increase in aircraft production. Much of the output would have to be devoted to forming new squadrons rather than equipping existing ones, and in consequence some current types of aircraft might remain in service rather longer than had been previously intended. But a number of new types of aircraft with performances superior to those now in service would be introduced this year and next year so that the general standard of the equipment would be improved despite the rapidity of the expansion now planned.

In view of the international situation, the previous plan, to which reference had been made, had been recast on a much larger scale, and the rate of implementation greatly increased.

Substantial orders had been placed for advanced fighters possessing a rate of climb exceeding that of the best jet fighters in service to-day in this or any other country and, what was equally important, they would be more manoeuvrable at height and have a greater fire power. The Venom would go into squadron service this year.

Of the auxiliary fighter squadrons fifteen were now equipped with Meteors and Vampires and the remaining five squadrons would be re-equipped with Vampire 5s in time for their three months' training this year. Mr. Henderson could see little prospect of building up the Auxiliary squadrons on a two-flight basis until the expansion programme was more advanced. Like several other members who spoke later in the debate, he paid a tribute to members of the R. Aux. A.F.

To accelerate the substantial build-up of the night fighter force, other types of jet night fighter, in addition to the Meteor N.F. 11, had been ordered, and there was under development an all-weather, two-seater jet fighter with the full range of radar and navigational equipment.

Improvements had been made in the home radar system, and when completed there would be a chain of radar stations encircling the U.K. even more efficient than was the case in 1945. New equipment was being introduced, and the number of regular airmen and airwomen manning the radar system full-time was being increased.

Some 9,000 (not 10,000 as previously announced) officers and men, the latter from the Class G Reserve, were being called up for a period of fifteen days' training this year.

Recruitment in the Royal Observer Corps had come on well in recent months, and there had been a net increase of 1,200 in its strength.

Plans for B.A.F.O.

Concerning land/air warfare, Mr. Henderson said that the R.A.F. contribution would be largely composed of fighter-bombers and light bombers. The number of fighter and ground-attack squadrons in Germany was to be substantially increased this year. Our Air Forces in Germany would be allocated to the Supreme Allied Commander, Europe. In addition, the light-bomber squadrons of Bomber Command would be allocated to the Supreme Commander, and operated by the Commander-in-Chief Bomber Command on his behalf. The medium-bomber squadrons of Bomber Command would also be at the general disposal of the Supreme Commander, but in the latter case the British Chiefs of Staff would reserve the right to direct these elements of Bomber Command to other tasks as and when required for the defence of the U.K. The fighter-bomber squadrons which had been referred to were equipped with Vampires. Several new squadrons had been recently formed, and many more would be formed during the next two years. All these new squadrons would be based on the Continent.

The first Canberra squadron, shortly to be formed, would be the forerunner of the large light-bomber force to be equipped with this outstanding type. In due course photographic-reconnaissance squadrons would be equipped with Canberras, and others were being re-equipped with the latest Meteors. Photographic reconnaissance remained to-day indispensable and vital to Bomber Command.

Information had just been received that the Canberra had been adopted for service in the United States Air Force. It would be produced under licence in America. This was in addition to production lines to be laid down in this country and Australia.

America had also bought the manufacturing licence for two of our latest jet engines—the Sapphire and another still on the secret list. If the U.S.A. with its immense resources needed British aircraft and engines, we need not doubt that we retained our position as one of the foremost countries in aircraft production and development. It must not be forgotten, however, that the R.A.F. had received, and hoped to go on receiving, American help in the supply of aircraft and equipment.

A substantial force of medium bombers—Washingtons and Lincolns—which in wartime would have certain special duties to perform as well as contributing to our overall bombing effort, would be retained. In due course they would be replaced by long-range jet bombers, for the first of which

a production order had been placed. This four-jet machine would soon be flying—with a speed faster than the Canberra's and with greatly superior load and range.

It was planned greatly to expand Coastal Command during the next two years, continued Mr. Henderson. During this period it would also be largely re-equipped. The Shackleton had at length completed its tests and been accepted for service in the squadrons. A number of medium-range reconnaissance squadrons would also be formed and equipped initially with P2Vs (Lockheed Neptunes) supplied from America under the military aid programme.

At this point questions were asked about flying-boat replacements and particularly about the Princess flying-boat, but nothing tangible emerged from the answers except that a flying-boat project in the design stage was under consideration.

Sunderland flying-boats, two squadrons of which had been giving good service in Korea, would continue to be used.

The successful ferrying of 44 Vampires to the Far East was a tribute to the high standard of flying in the R.A.F. and to the excellence of the machines that were ferried.

Reductions in Transport Command had been halted, but it was not possible at present to expand the Command once again. Both Middle East and Far East Air Forces had sizable transport forces of their own, and a sufficiently large Transport Command would be maintained in the U.K. Mr. Henderson went on to mention the contribution made by the civil corporations and charter companies, and the formation of the first auxiliary transport squadron, primarily with the staff of Airwork, Ltd. (see page 322).

Mr. Henderson then turned to the subject of manpower. Strength to-day was 230,000 and in March, 1952, should be around 255,000. The regular content of the force was now 63 per cent, and should rise by the end of the year to about 70 per cent. An impetus had been given to regular recruitment by the new trade structure and pay arrangements. Entries to Cranwell were satisfactory, but the number of university graduates accepting permanent commissions fell short of needs. Many more regular and National Servicemen were needed under the new programme.

It was essential to encourage a high proportion of those young men who had the mental powers, the physique and the education for the forefront of our first line of defence to volunteer for flying duties. Their conditions of service to-day were excellent, though no better than they deserved.

There had been a substantial improvement in regular recruiting to ground trades. In the six months up to February, 1951, 23,000 tradesmen were recruited to regular service compared with 7,000 in the previous six-month period. Of 22 trade groups in the R.A.F., only the medical and catering groups are manned to less than 95 per cent of their establishment. It was true that there were still deficiencies in some of the more advanced trades such as armament- and radar-fitter.

Next the Secretary of State for Air referred to the increased use of National Servicemen. When certain changes which were being made in aircrew training courses became fully effective, National Service pilots and navigators would be able to fly in operational squadrons for the last four to six months of their national service, and other aircrew categories for even longer.

The picture regarding the Women's Royal Air Force was somewhat disappointing, the strength of airwomen having fallen by some 1,500 to 8,500 during the year.

Of Halton, the Minister said that about a quarter of the aircraft apprentices who passed out last year were awarded National Certificates in mechanical and electrical engineering, and three obtained Whitworth Society prizes, which are awarded to the best candidates throughout the country. Eight aircraft apprentices who had been selected for university courses in engineering leading to permanent commissions in the technical branch, completed their three-year courses last June, five obtaining second-class honours degrees.

Mr. Henderson then referred to the great assistance in the rapid expansion of the training organization received from the Canadian Government. Substantial air training facilities had been allotted to the U.K. this year.

Recruiting for the R.Aux.A.F. fighter squadrons and for pilot duties in the R.A.F.V.R. had been most successful, but the position in other units of the R.Aux.A.F. and in ground branches and trades of the R.A.F.V.R. was not satisfactory.

An R.A.F. voluntary radio service was being formed to strengthen the reserve behind the Signals Branch of the R.A.F. This would comprise both civilians and V.R.s.

The thousand R.A.F. reservists to be called up would be trained on special flights which were being formed of Harvards, Spitfires and Vampires, and they would all receive full operational training in modern jet-fighter technique.

Mr. Henderson was glad to report that three more university air squadrons—Bristol, Liverpool and Hull—had been reformed, bringing the total number to 17. Fighter-control flights had been formed in the University squadrons of Oxford, Cambridge and London.

The strength of the A.T.C., which celebrated the tenth anniversary of its foundation this year, was now 44,300 cadets. The age limit for entry to the R.Aux.A.F. and R.A.F.V.R. had been reduced to 17.

On the subject of the "formidable programme of works services," Mr. Henderson said that many airfields which had been released by the R.A.F. would be brought back into use. Some would need resurfacing, strengthening and lengthening. A good deal of the work had already been started.

Compared with 6,700 married quarters in use at home and overseas in September, 1939, there would be 14,500 completed quarters by the end of this month. On completion of the present programme up to the end of 1952, the number would be increased to 23,000.

The Debate

MR. ANTHONY EDEN was the first to comment on Mr. Henderson's statement. After opening remarks concerning the use of "security" as an excuse for saying very little at very great length (and speed), he asked how the machines in our fighter squadrons to-day compared with those of the other great Powers. "We are told that consideration has been given to re-equipping with the American F-86 Sabre," he said. "Are the Sabres an interim contribution so that we may be comparable with foreign Powers pending the arrival of our new types which are, as yet, only on the drawing-board?" Mr. Henderson replied that we were seeking to supplement the present fighter squadrons, in which we had every confidence, with the additional number of F-86s. Questioned further, he agreed that the Sabres were faster than any machine that we now had in the R.A.F. No answer was given to another question put by Mr. Eden as to when new machines, of which so much had been said—apart from the Sabres—would be available for the squadrons.

Turning to the subject of the R.Aux.A.F., Mr. Eden asked questions about re-equipment of squadrons which had old-type jets that had done a great deal of flying, and commented on the considerable strain entailed in operating jet fighters. It would never be easy to get men of the quite exceptional quality to do this training, especially on a part-time basis.

On the subject of jet night-fighters, Mr. Henderson had given the impression that this matter was going along very nicely, but had we any jet night-fighter squadrons now?

Mr. Eden also hoped that the Government would consider the possibility that an airborne landing might be attempted here.

Turning to a matter raised recently by Viscount Trenchard, Mr. Eden asked how far should we go in trying to meet offensive operations and also an airborne invasion with fighters, and how far should we be prepared to attack the bases from which the enemy bombers might operate. Many of our great air authorities were convinced that a strong bomber force was an effective deterrent, and he believed that they were right.

He felt that the Government had something in mind in connection with new flying-boats to assist Coastal Command in its operations. He hoped that this was so, because a fast flying-boat was certainly necessary.

MR. J. E. HAIRE would have liked to have heard more about night fighters than that this year we hoped to have more of them operational. He wished also to put on record that the presence of American bomber and fighter squadrons in this country was welcome to us in helping us to face our present problems.

MR. P. B. LUCAS made a long and well-considered contribution containing considerable technical detail. He addressed himself primarily to the development of the Soviet Air Force in particular relation to the supply of our own aircraft stores (Vote 7 of the Estimates). He was driven to the conclusion that the expansion of the Soviet Air Force between 1945 and 1951 was comparable only with that of the German Air Force between 1935 and 1939. He saw that it would be unwise for the Secretary of State to say too much, but believed that people who were going to be asked to make still greater sacrifices wanted to know what they were up against.

(*Concluded at foot of page* 305)

FROM ALL QUARTERS

ENTER THE F.D.1: Some years ago the Fairey Aviation Company advocated a research programme based on the delta configuration. Pilotless radio-controlled models were tested and now the full-scale F.D.1, here depicted, has been flown by Mr. Gordon Slade at Boscombe Down for 17 minutes. Power unit is a Rolls-Royce Derwent; dimensions: span 19ft 6½in, length 26ft 3in. It is intended for "important research work with revolutionary possibilities in the design and operation of fighter aircraft."

More Space for Avon Production

AS a result of negotiations between the Government and Rolls-Royce, Ltd., three new factories are to be made available as soon as possible for increasing Avon production. Buildings will be made available forthwith at the industrial estates at Blantyre and Larkhall, Lanarkshire. (These are similar to the wartime Hillington, Glasgow, estate, where Rolls-Royce already have part of a factory which was built and in production on Merlins within 12 months.) The third new factory has yet to be built at a site inspected and approved at East Kilbride. Instructions to proceed with this are awaited. Thus, to date, seven factories have been named for Avon production in Great Britain alone.

B.E.A. Helicopter Services

THE M.C.A. has announced that B.E.A.'s helicopter services between Cardiff and Liverpool will cease with effect from March 31st. Since these flights began last summer they have, it is stated, yielded valuable experience in the scheduled operation of rotating-wing aircraft over particularly hilly terrain in all weathers. In order to obtain data on operations under entirely different traffic conditions, a daily passenger service is to be started between London and Birmingham in the early summer.

This will also give the Corporation and the M.C.A. traffic-control staffs practice in integrating services by helicopter and fixed-wing aircraft at busy airports.

England—N.Z. Race News

MORE details have been announced by the Royal Aero Club of the arrangements and conditions of entry for the 1953 international air race between England and Christchurch, New Zealand. The race is being organized jointly by the Royal Aero Club and the Canterbury International Air Race Council; entries must be sent to either, together with entrance fees of 100 guineas per aircraft per section, by January 31st, 1953. The race will begin from a British airfield or seaplane base, yet to be decided, on or about October 10th, 1953.

Provided that their speed and range enable them to complete the course within 168 hours, aircraft may be entered in either the speed section or transport-handicap section—or both. Winner of the speed section will be the aircraft to complete the course in the shortest time; the aircraft arriving first at Harewood Airport, Christchurch, will win the transport section. Starting will be by handicap for the transport-section aircraft and also for those entered in both sections.

Both sections of the race will be flown concurrently, and pilots will be allowed to choose their routes, provided that they land at the intermediate point (in the region of Basra). Competitors in the speed-section will be allowed to use flight-refuelling.

Provisional entries have so far been made—in the transport-handicap section—by B.E.A., B.O.A.C., K.L.M., Qantas and Sir W. G. Armstrong Whitworth Aircraft, Ltd. The de Havilland company will also compete, but has not yet chosen its section.

Canberras by Martin

AMERICA'S decision to adopt the English Electric Canberra for the U.S.A.F. was officially announced by the Department of Defence on March 6th in the following terms :—

"The U.S. Air Force has directed its Air Materiel Command at Dayton, Ohio, to contract for production in this country of an undisclosed number of the British Canberra light jet bomber.

"Current plans call for The Glenn L. Martin Company of Baltimore, Md., to build a night-intruder version of the twin-jet high speed aircraft under licence from the English Electric Company, Ltd., Rugby, England.

"The Canberra was flown from Langley Air Force Base, Virginia to the Martin plant yesterday (March 5th). Martin engineers study the aircraft to speed up pre-production planning.

"Martin is continuing to develop its own light jet bomber, the XB-51, and the Air Force has authorized the company to prepare one of the two experimental models as a production prototype."

Adoption of the Canberra follows the record-breaking non-stop transatlantic flight from Aldergrove to Gander a few days earlier (reported in *Flight* of March 2nd). Martin manufacture of the aircraft (the U.S.A.F. version will probably have American-built Sapphires instead of the Avons now employed) was foreshadowed by the recent visit to Britain of Lt. Gen. K. B. Wolfe, Deputy Air Chief of Staff for Materiel, and members of the Martin company.

Contrary to some reports, incidentally, the Canberra is not the first British military aircraft to be built in America; the D.H.4 and S.E.5A were among early British designs exported to the States.

B.E.A.'s New Board Member

HIS numerous friends will be glad to hear of the appointment, by the Minister of Civil Aviation, of Mr. S. Kenneth Davies, C.B.E., as a part-time member of the Board of B.E.A. The appointment was dated from March 12th and is effective for three years.

Mr. S. Kenneth Davies

Mr. Davies, who is 51, is a well-known Welsh industrialist who for many years has been a prominent figure in sporting aviation. As a founder-member of the Cardiff Aeroplane Club he obtained his "A" licence in 1930 and in recent years has attended many of the larger international rallies. He is vice-chairman of the Royal Aero Club.

His appointment, no doubt, arises from the fact that he is chairman of the Welsh Advisory Council for Civil Aviation. As managing director of Cambrian Air Services he has also a personal interest in the development of air transport in the Principality. Mr. Kenneth Davies was appointed a C.B.E. in the New Year Honours List last January.

M.C.A. Helicopter Report

THE Ministry of Civil Aviation has now published the first report* of the Inter-departmental Helicopter Committee, which was first appointed on August 5th, 1948, to investigate the prospects of the helicopter in future commercial use on internal services within the United Kingdom. The committee, which was under the chairmanship of Sir George Cribbett, K.B.E., C.M.G., has also reported on rotor station and traffic control requirements and on the development work which will be necessary to achieve the regularity needed for successful commercial operation.

The committee states that the helicopter must be regarded as "a coming medium of transport" over distances between 50 and 300 miles; it considers that a 10/12-passenger type can probably be in service by 1954, and recommends that a 20-passenger version with higher cruising speed should be aimed at by 1958. Machines of the latter type, says the report, are expected to prove fully economic for use on scheduled services, although the 10/12-passenger type represents an essential stage in the development of more suitable equipment. Even the 10/12-passenger type, however, will not compare unfavourably with fixed-wing aircraft on certain internal routes of limited traffic-potential.

The cost of the ground organization required, the committee reports, should be considerably lower than the corresponding requirements of comparable fixed-wing aircraft. Ultimately,

* *M.C.A.P.92; H.M. Stationary Office, Price 1s. 3d.*

helicopter bases should become financially self-supporting at landing fees below current rates for conventional aircraft. The committee is of the opinion that the helicopter can make an important contribution to Britain's transport system by carrying passengers, freight and mails between provincial towns and cities on journeys where surface transport times are disproportionate to the distances involved. It can also be used to provide speedy and convenient communications between, on the one hand, international airports and seaports, and, on the other, between such airports and the provinces.

It is estimated that when the 20-plus passenger type is available, a fleet of 50 such machines may be absorbed initially on internal services; this number may be increased to 100 within a few years. The report also reveals the hitherto unannounced fact that the Ministry of Supply has authorized the Fairey Aviation Co. to proceed with the preliminary development work on a 23-passenger helicopter, designated the Rotodyne. It will be powered by two turboprops and will cruise at 135 m.p.h. It will have separate reaction units fitted at the blade-tips for use on take-off or in emergency. The head of Fairey's Rotorcraft Division has reported to the committee his belief that the prototype can be built this year and that production versions should be available by 1953.

Technical Old Boys

THE de Havilland Aeronautical Technical School is now 22 years old, and its 1,900 ex-students are to found—many of them in high places—throughout the world's aircraft industries. Most good schools have old boys' associations, and thus it is no less than fitting that the D.H. Tech School should follow so well-established a precedent—indeed, it is to be wondered at that such an organization was not formed long since. Be that as it may, an old boys' association now exists, and if the inaugural meeting on March 3rd at Hatfield was anything to go by, it would seem to be assured of unqualified success.

Mr. F. T. Hearle, Chairman of the de Havilland Aircraft Company, has agreed to be President of the association, and in his speech said that the inaugural meeting would be a happy evening to remember—there were so many faces there one remembered from the past. He was honoured to be the first President of the association, and hoped that membership during the years would increase. He knew he could speak for the directors of the company in expressing pleasure at the number of Technical School men who had gone out from de Havillands into the aviation world at large, many of them to achieve high success.

Mr. Hearle then stated the aims of the association as being not only to continue the friendships made at the School, but also to be a medium for the interchange of experiences gained by the old boys working in all branches of the industry at home and abroad. This would be achieved by social gatherings in London, Hatfield, or anywhere in the world where old boys cared to meet, by sending copies of *The Pylon*—which would include old boys' news and, once a year, a list of addresses of members, and by including old boys' news in *Enterprise* (the de Havilland house magazine) which would be posted to all members who were not in the Enterprise at home.

Offers to form branch associations had already been received from Canada, India and the U.S.A., and it was confidently expected that a branch would also be formed in Australia. Keenness to form a Golfing Society, and Sailing and Gliding Societies, had already been manifested, and it had also been suggested that "London evenings" and an annual ball might also be made a feature of the association.

S/L. R. W. Reeve, Principal of the D.H.Ae.T.S., had agreed to accept office as Vice-President of the association, and the following caretaker committee and officers had also agreed to serve: *Chairman*, Mr. F. T. Meacock; *Vice-Chairman*, Mr. K. E. Westover; *Treasurer*, Mr. F. I. Marking; *Committee*, Messrs. K. T. Fulton, A. D. M. Hill, R. J. K. Holland, G. I. Sprent, J. M. Ramsden; *Secretary*, Mr. J. C. Collett; *Asst. Secretary*, Mr. J. C. Newman.

THE AIR ESTIMATES

(concluded from page 303)

In 1945 the Russians were perhaps three, four or five years behind ourselves, the Americans and the Germans, but he believed that a considerable portion of the gap had been bridged by their inheritance from the Germans. In the operational development and production of rocket and jet-propelled aircraft the Germans were ahead of us at the end of the war. In 1945 the fruits of German research and development became potentially available to the Russians, together with designers and technicians.

It appeared that the Russians had had swept-wing fighters of advanced design in service for nearly two years, yet at this time the R.A.F. had no British swept-wing fighter in squadron service.

An outstanding wing leader of the R.A.F. of the late war had recently been observing in Korea. He had said that the Mig-15 "... is as good as, or equal to, the American Sabre jet. The Sabre is the best fighter in the western world." In plain words, that meant that if the Russians were to attack in Europe this summer there would be no British fighter in the R.A.F. squadrons equal in performance to the Mig-15.

Mr. Lucas was another speaker to quote Lord Trenchard, saying, "Let us resolve with him that the vital overriding defence measure to prevent war, and in the event of war, to win it ... is an Air Force of long-range machines."

MR. SHACKLETON, in the course of a lengthy contribution, said that there was great operational convenience in connection with the flying-boat and, however far it was necessary at this stage to drop development, he hoped that the technique and operation of flying-boats would not disappear from the Air Force.

SURGEON LT-CDR. BENNETT was concerned about liaison between the Navy and Coastal Command. The long-range aircraft was the weapon that we needed. He was also another speaker concerned about the present British fighters *vis à vis* the Mig-15, and asked was it not a fact that British fighters now in service were actually 100 m.p.h. slower than the Russian aircraft which was in quantity production.

MR. TOMNEY stressed the importance to the fighting Services of reliable electronic equipment. He was supported in his views by SIR P. MACDONALD, who was concerned also about the preservation of existing radar equipment. This speaker also wished to know why the jet fighter flying-boat had been neglected—only three were ordered; only one existed.

A number of speakers then discussed the question of photographic reconnaissance and its importance to all operational Commands and from the point of view of Intelligence. It was hoped that the importance of P.R.U. would not be under-estimated and that it would not come under the domination—as an ancillary—of Bomber Command.

MR. EMRYS HUGHES, in a discussion of costs and of the atom bomb, concluded by challenging the assumption that £380 million spent on the R.A.F. was going to give protection to the industrial populations of Liverpool, the Midlands and the North.

A. CDRE. HARVEY touched upon many points. He said that it was obvious that at the moment there was a shortage of practically all aircraft and almost all equipment. This was the penalty of lack of foresight and, to some extent, neglect in the last three or four years. Money had been voted, and he could not understand where it had gone.

He had been delighted to read that further Auxiliary transport squadrons were planned in conjunction with air-charter firms. This was liable to give the impression that when they were formed we should have four complete squadrons, but he was told that in fact there would be two aircraft in each squadron with a certain number of officers and men training at weekends. This matter ought to be reviewed. The minister would be far better advised to form complete Auxiliary squadrons.

The Government had waited far too long to decide about the prototypes which had given great performances at the Farnborough Display, so that we had one or two of each instead of squadrons fully equipped. Would the aircraft now being ordered be comparable when we got them in two or three years' time to aircraft of foreign powers, after a lapse of another three years?

That the remaining five our of 20 Auxiliary squadrons were to get Vampire 5s was cheerful news, but when would the other 15 squadrons get new aircraft? He was informed that some were still flying the original Vampires which had been brought home from the Middle East, discarded by Regular units.

A certain band of (Government) members were always crabbing the Americans, said A. CDRE. HARVEY, but they would be well advised to inquire a little more into what they have in the way of equipment. It was our American friends who would help us if we got into serious trouble. After spending a whole day on the B-36 at Lakenheath, and learning that the aircraft cost £1½ million each, had a crew of 19, could carry 80,000 lb of bombs, and fly 10,000 miles non-stop with a smaller load, A. Cdre. Harvey had gone home far more cheerful than he had been for months.

Answering for the Government, MR. AIDAN CRAWLEY referred to timing and available production capacity, and said that he believed it would have been a mistake to make the expansion of the Air Force, now taking place, two or three years ago. Later, Mr. Crawley said it was quite clearly absurd to say that we had thought of strategic bombing without considering the Americans. Largely from their strategic needs in the world, they had put strategic bombing very high, whereas this country had found it necessary to give equally high priority to the building of a fighter force.

He had no doubt whatever that our fighters—the types we were now using—would give a very adequate account of themselves against the Mig-15 or any other aircraft. Some of the very interesting figures given by Mr. Lucas and others could not be described as anything more than an estimate and a speculation. Not only had aircraft exactly or nearly comparable to those we were using fared well against the Mig-15, but no American aircraft up against them had appeared to be outclassed.

Regarding our pilots, Mr. Crawley thought that it was most remarkable that their technical skill seemed to be keeping pace with the technical improvements in the machines. The new technique had been developed to a remarkable degree. The greatest improvement of all had, he believed, been made in the training of the pilots themselves. There were more people now in the Air Force per aircraft than there were before the war, and each aircraft was more efficient.

On the question of the ability of auxiliary squadrons to cope with modern fighter flying, Mr. Crawley believed that it could be done. He wondered if the term "Auxiliary" had not become out of date, for the training of some squadrons was already equal to Regular squadrons.

Concerning flying-boats, he could only say in general that the experts now considered that the demands of Coastal Command and other Commands could be better met by land-based aircraft. There was no mystery about the Princess flying-boat, but a final decision had not yet been taken.

It was apt to be forgotten that there was a very big reserve of civil aircraft operating in this country now, as much or as little as necessary of which could, and would, be taken over by Transport Command in war.

HERE AND THERE

1951 S.B.A.C. Show

IT has now been definitely decided that Farnborough will again be the scene of the S.B.A.C. Flying Display and Exhibition, to be held from September 11-16th. The first four days—Tuesday, Wednesday, Thursday and Friday—will be technicians' and guests' days; the public will be admitted on the Saturday and Sunday.

A Canberra for Australia

IN preparation for Australian production of the Canberra, one of these aircraft is likely to be flown to the Commonwealth by an R.A.A.F. crew; an announcement about the method of delivery was expected earlier this week. A newspaper report, on March 8th, that a Canberra would attempt a 24-hour flight to Australia, using flight-refuelling, was officially described as "misleading and inaccurate."

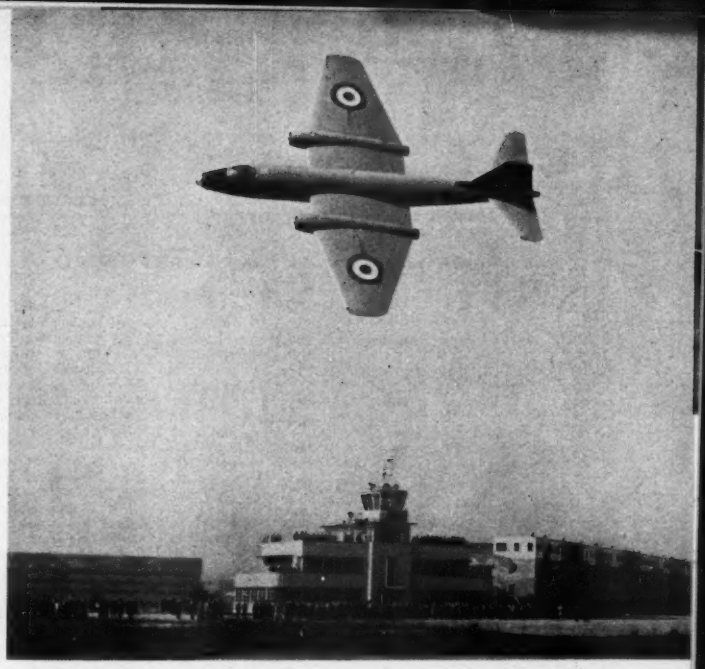
International Gas-turbine Courses

OVERSEAS engineers visiting Britain for the Festival or the S.B.A.C. Show will be able to take advantage of two "international" courses arranged by the School of Gas Turbine Technology, Farnborough, to coincide with these events. Both courses are of post-graduate standard and cover the design and application of gas turbines (industrial and for aircraft) in a three-week syllabus. The first, coinciding with the early part of the Festival of Britain, lasts from May 27th-June 15th; the second is from September 16th-October 5th.

Bristol's Royal Visit

FOLLOWING the cancellation of Cheltenham Races, which they were to have attended on March 8th, H.M. the Queen and H.R.H. Princess Margaret made a 50-minute lunch-time visit to the Bristol Aeroplane Company's works and airfield at Filton. They were welcomed by Mr. Brian Davidson, the company's commercial director and, after signing the visitors' book in Filton House, drove to the Brabazon assembly hall, where their entrance was cheered by a group of workers. The Queen and Princess Margaret were introduced to a number of Bristol executives, including Mr. A. E. Russell, chief designer; Mr. F. M. Owner, chief engineer; Mr. Eric Ross, company architect; Mr. R. S. Brown, general manager (aircraft division); and Mr. F. D. Chard, Brabazon production manager.

Then the Royal party met Mr. A. J. Pegg, chief test pilot, and members of the Brabazon crew. They spent 15 minutes inside the vast aircraft, and showed great interest in its construction and controls. "Her Majesty," reported Mr. Pegg, "insisted on going into the wings and behind the engines." A picture appears below.



BEAMONT IN BALTIMORE: With a typically brilliant demonstration of the Canberra for members of the Martin Company at their Maryland plant, W/C. Roland Beamont put an appropriate seal on the agreement (reported elsewhere in this issue) permitting the American company to manufacture the English Electric bomber for the U.S.A.F. The Martin audience were greatly impressed.

A. Cdre. Oliver Honoured

RECENTLY appointed Deputy Lieutenant of the County of Staffordshire is A. Cdre. John Oliver, manager of the aviation products department of the Goodyear Tyre and Rubber Co. of Great Britain. A. Cdre. Oliver, who served for 30 years with the R.F.C. and R.A.F., is president of the Wolverhampton Aero Club.

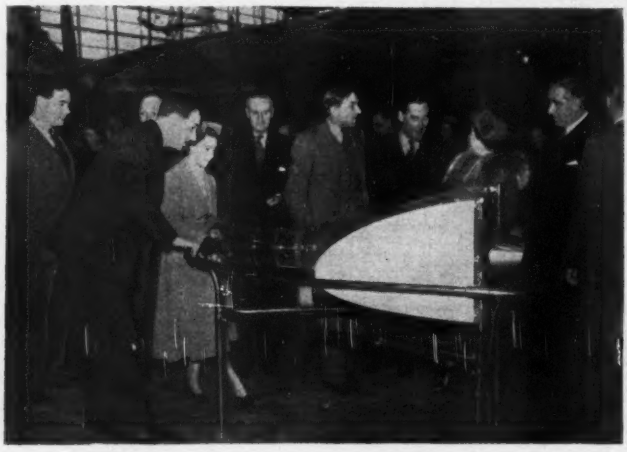
France's Fastest

AT Istres, on March 5th, the Marcel Dassault 452 Mystère reached a speed of 674 m.p.h.—the fastest ever attained by a French aircraft, and 2 m.p.h. in excess of the world's speed record. The Mystère is a swept-wing version of the Nene-powered Ouragan fighter.

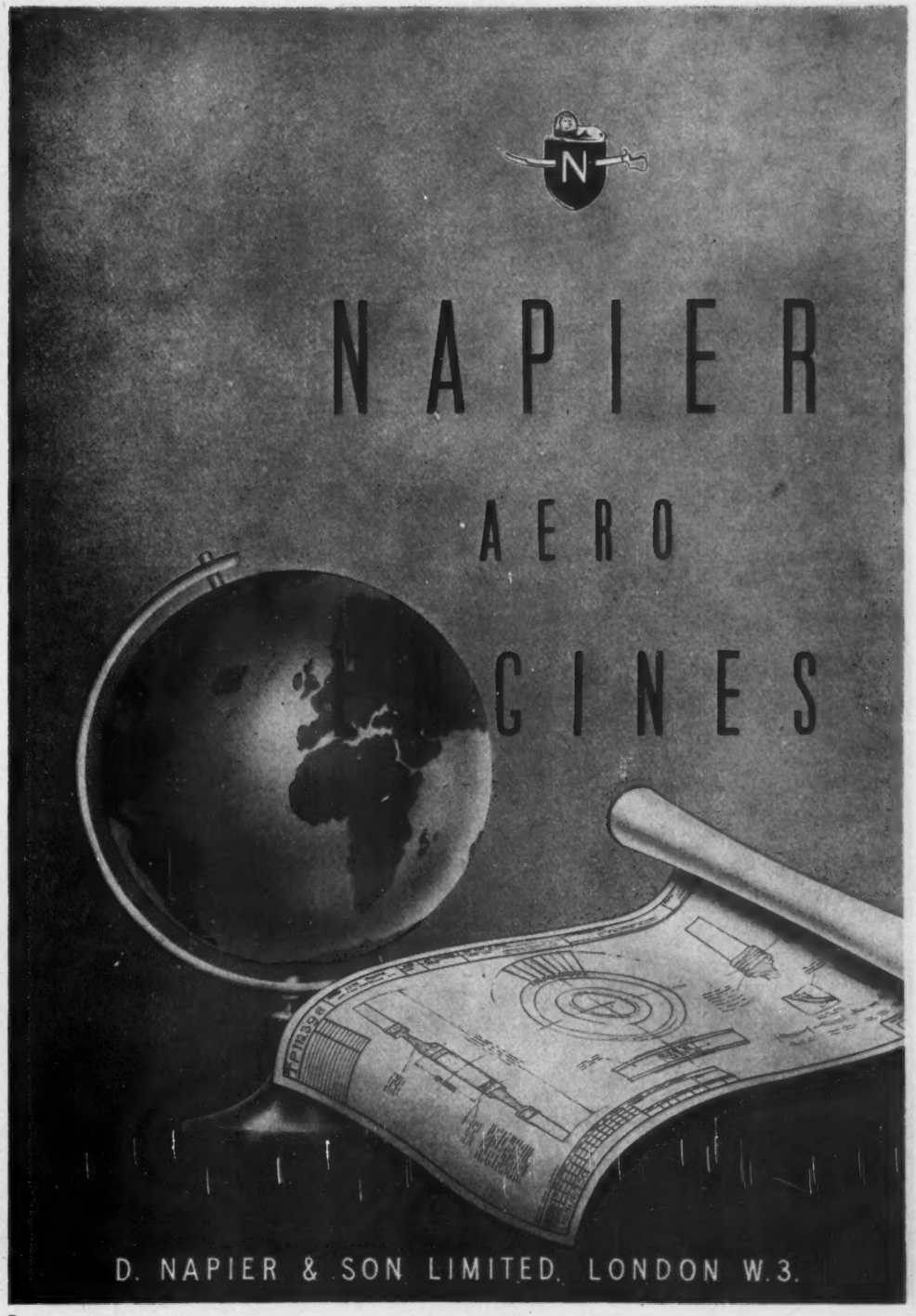
Progress of the B-52

LIKE the new four-jet bomber ordered for the R.A.F., the Boeing B-52 is to be produced "from the drawing-board," and a contract will shortly be placed for this heavy bomber.

Designed to succeed the B-36, the B-52 is basically a larger version of the swept-wing, six-jet B-47, which is in production. Pratt and Whitney are reported to be developing the J-57 axial-flow turbojet for the B-52; the unit is said to have made



UNEXPECTED HONOUR: As reported above, H.M. the Queen and H.R.H. Princess Margaret visited the Bristol Aeroplane Company's works at Filton last week. They are seen inspecting a Perspex model of the coupled Proteus with (left to right) Mr. F. M. Owner, Mr. Brian Davidson and Mr. "Bill" Pegg.



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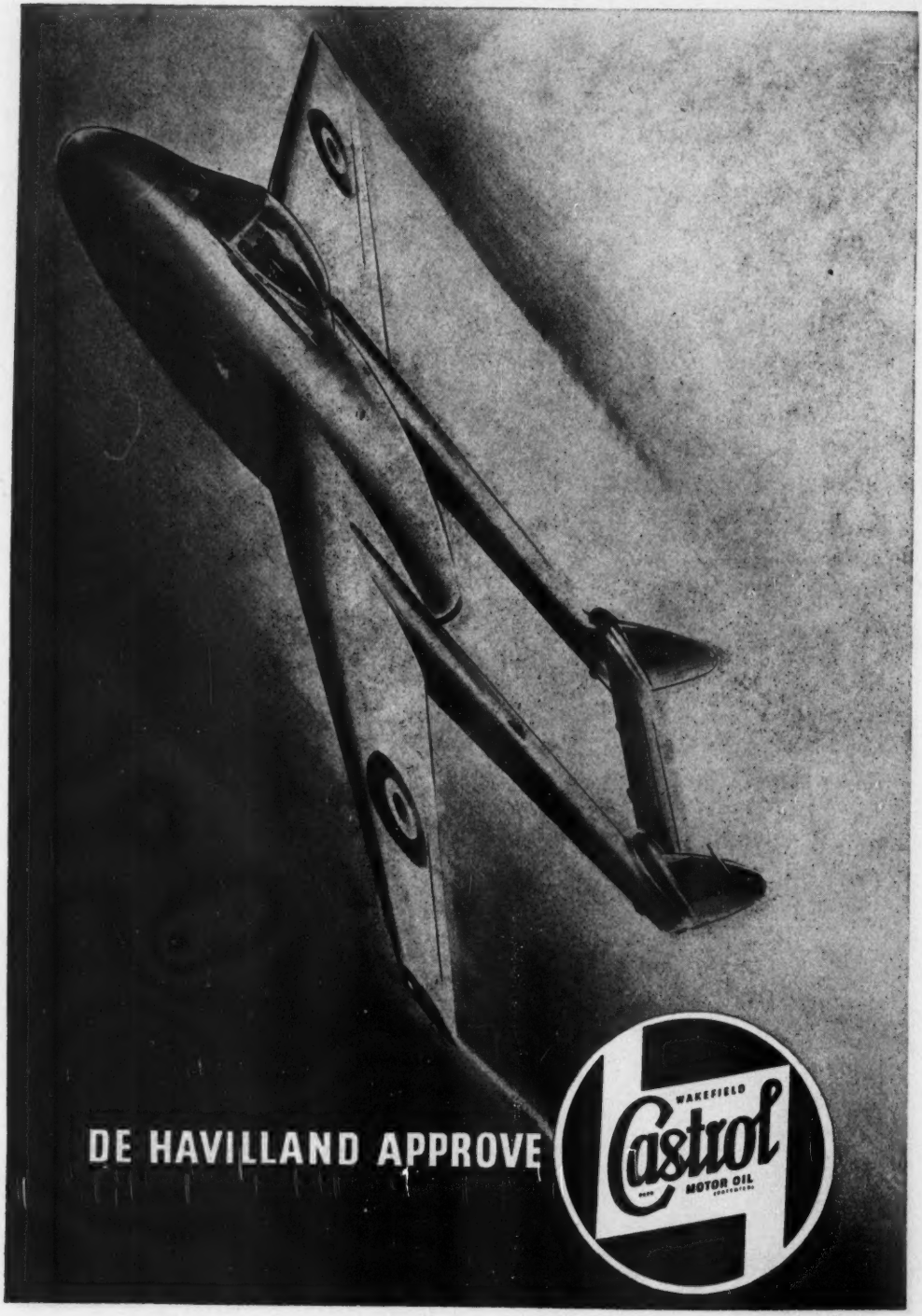

DE HAVILLAND APPROVE
WAKEFIELD
Castrol
MOTOR OIL

HERE AND THERE . . .

good progress in ground-running and is shortly due for flight-testing beneath the fuselage of a B-50 test-bed.

Aircraft for Yugoslavia

REPORTS that Jugoslav pilots might be sent to America for training have been coupled with suggestions that Britain and America might supply Yugoslavia, the only Communist nation to defy the Soviet, with military aircraft. Should Marshal Tito ask for such support, the Anglo-American attitude would be one of "favourable consideration." So far, no request has been made.

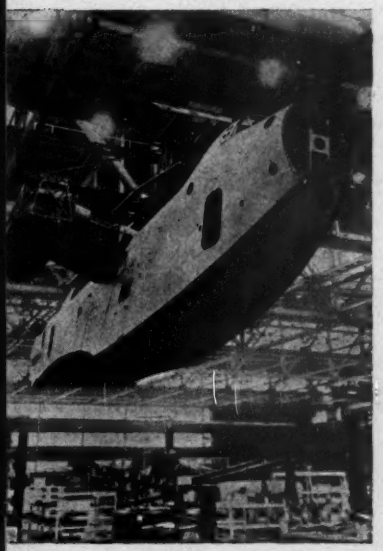
The Sound of Speed

AUDIBLE shock-waves were demonstrated by two F-86 Sabres recently at Edwards Air Force Base, Muroc, California. The aircraft climbed to 40,000ft ("in something like 10 minutes") and then dived at supersonic speed to about 24,000ft, where 5g pull-outs were made. Some 20 to 30 seconds after each pull-out, ground observers heard a distinct double blast. The phenomenon—which has previously been reported without explanation—is presumed to be an effect produced by the under-wing shock-wave shed by an aircraft on pulling out of a supersonic or near-sonic dive.

Military Jetliner

IT was announced on March 6th that the Avro Canada Jetliner had been flown to Wright Field for evaluation by the United States Air Force. Although the performance of the aircraft—illustrated recently by a 1,000-mile flight from Miami to New York at nearly 450 m.p.h.—has aroused deep commercial interest in North America, no definite orders have so far been placed. The Jetliner is powered by four Rolls-Royce Derwent 5s.

The U.S.A.F. has shown interest in two other Canadian aircraft—the high-performance Canuck all-weather fighter, also built by Avro Canada, and the D.H.C.2 Beaver bush transport. A quantity of Beavers has been ordered from de Havilland of Canada for Arctic duties, and some are already in service.



IN THE AIR: Production-line view of the hull of a Martin P5M-1 Marlin (two Wright R-3350 radials) anti-submarine flying-boat. The U.S. Navy recently increased for the fourth time its production-order for the Marlin, which is designed to succeed the war-time Mariner.

PRISONER-OF-WAR: The first photograph (from a Chinese source) to show a U.N. aircraft shot down by the Communists in North Korea—an F4U Corsair of a U.S. Marine squadron, showing signs of battle-damage. Markings forward of the cockpit indicate over 50 missions.

American Records

TWO performances by American pilots have been homologated by the F.A.I. as world-class records. Miss Caro Bayley's climb to 9,206m (30,187ft) in a Piper Super Cub at Miami on January 4th sets a new altitude record for light aircraft in category C.1.b. Two single-seater glider records were established by William Ivans in a Schweizer SGS 1-23 at Bishop, California, on December 30th, 1950: for absolute height, 12,832m (42,100ft); and gain of height, 9,174.5m (30,100ft).

IN BRIEF

THE lecture *Turbine-engined Aircraft*, which was to have been given before the Weybridge branch of the R.Ae.S. on March 14th by Mr. George Edwards, was postponed; instead, the lecture by Mr. Handel Davies on *Some Aspects of Flight Research* was substituted.

* * *

In succession to Sir Allan Gordon-Smith, K.B.E., D.L., who died recently, Mr. Ralph Gordon-Smith, managing director of S. Smith and Sons (England), Ltd., has been appointed chairman.

* * *

Users of Rotol equipment who do not already possess one should find the company's loose-leaf service bulletin of particular value. Insertions, dealing with Rotol aircrews, de-icing equipment and other products, are periodically issued.

* * *

Mr. Leslie Gamage, vice-chairman and joint managing director of the General Electric Co., Ltd., left London Airport recently for Ceylon, Australia and Malaya. Before returning, on April 29th, he will visit G.E.C. branches in Sydney, Melbourne, Adelaide, Perth and Brisbane.

* * *

Wolf Electric Tools, Ltd., Hanger Lane, London, W.5, announce a new 10in portable electric saw, the type R.S. 10. Frame construction is of magnesium alloy, and an extremely powerful motor is employed. The saw is fully guarded and a range of special blade types is available.

* * *

On the retirement, after 36 years' service, of Mr. Elliott A. Evans, M.I.Mech.E., F.R.I.C., chief chemist of the Wakefield group of oil companies, the following appointments within the group are announced: G. H. Thornley, M.Sc., Tech., F.Inst.Pet., as technical manager; P. W. L. Gossling, B.Sc., F.Inst.Pet., laboratory manager; J. S. Elliott, M.A., research chemist; N. E. F. Hitchcock, B.Sc., M.Inst.Pet., development chemist.

* * *

Mr. R. L. Prain, O.B.E., a director of several companies connected with mining, has been appointed to the Board of the International Nickel Co. of Canada, Ltd.

* * *

The new assistant head of television administration at Alexandra Palace is Mr. Leslie Page, who flew Spitfires in the Battle of Britain, from June to November, 1940. Later, as a Wing Commander, he commanded No. 613 Squadron.

* * *

Jenks Brothers, Ltd., Britool Works, Bushbury, Wolverhampton, announce that they have available a full range of socket, ring and jaw spanners for the new unified hexagons.

* * *

Mr. Denis Harper, B.Arch., Ph.D., F.R.I.B.A., A.M.T.P.I., A.I.L.A., and Mr. J. P. Thompson, A.M.I.C.E., A.F.R.Ae.S., A.M.I.Struct.E., have become associates in the firm of Norman and Dawbarn.

* * *

British air services, cars and radio will be represented at this year's Lyons International Fair by, respectively, British European Airways, Rootes, Ltd., and Vidor and Co., Ltd. The Fair will be open from March 31st to April 9th.

* * *

At the annual general meeting of Tiltman Langley Laboratories, Ltd., Mr. A. Hessell Tiltman (chairman) said that plans for the exploitation of the company's remote-control flow valve and Gerritsen gear were well advanced; it was possible that a separate company would be formed to handle them.

CO-OPERATIVE AIR SUPPORT

Joint Demonstration by R.A.F. and U.S.A.F. Transport Aircraft

Illustrated by "Flight" photographs

OVER Berkshire, on the afternoon of March 6th, a transport support exercise was held by units of R.A.F. Transport Command and the U.S.A.F. Third Air Division. To witness the operations under the best conditions we accepted the hospitality of Lts. R. Kemmeling and W. W. W. Wicklund aboard a Fairchild C-82A Packet, one of a number of these excellent machines (from the 61st Troop Carrier Wing, 60th T.C. Group, 12th T.C. Squadron) which had flown over to Abingdon from their base at Rhein-Main in Germany. Spectators assembled at the Watchfield dropping zone included officers from the School of Land/Air Warfare, Col. Strickland (base commander, Rhein-Main), and Col. Bogue (group commander).

On take-off, we looked astern from the vast, dim, box-car interior of the Packet, through the paratroop doors and watched the green fields falling away at a quite alarming rate. We surmised that Lt. Kemmeling's facial resemblance to W/C. ("Canberra") Beamont might have some bearing on this memorable introduction to the Packet's performance. Having scaled the ladder to the bridge (the width and general spaciousness of the cockpit fully justifies the description) we saw, close to starboard, a most unusual and very impressive sight: two U.S.A.F. Packets were snugly formating on a Handley Page Hastings C.1 of the Transport Command Air Support Flight. The Hastings is the faster aircraft and its flaps were lowered for the run-up to the dropping zone.

The Hastings among the Packets at the head of the page is symbolic of R.A.F./U.S.A.F. co-operation in military transport flying. On the left, the same Hastings is putting down its containers on the Watchfield dropping zone. Below, a Halifax lets go its huge "paratechnicon."

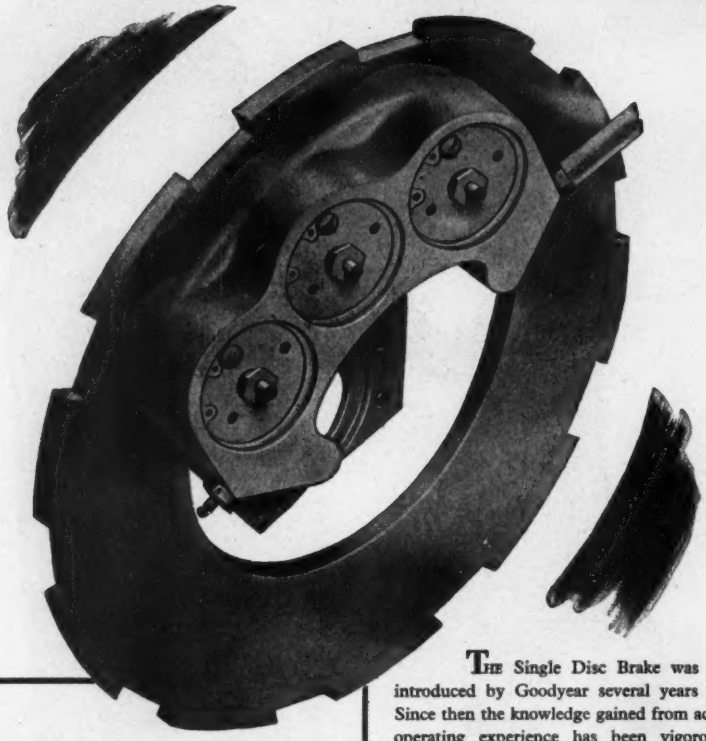
EXPERIENCED TRAVELLERS FLY BRITISH

BRITISH OVERSEAS AIRWAYS CORPORATION AND BRITISH EUROPEAN AIRWAYS

offer services to and from nearly 70 countries

Pioneered by GOODYEAR

. . . STILL THE LEADING DISC TYPE BRAKE



SIMPLE CONSTRUCTION · SIMPLE ACTION
SIMPLE OPERATION · EASY MAINTENANCE
AUTOMATIC LINING ADJUSTMENT
RAPID HEAT DISSIPATION

THE Single Disc Brake was first introduced by Goodyear several years ago. Since then the knowledge gained from actual operating experience has been vigorously applied, and to-day the Goodyear Single Disc Brakes have a reliability unique in their field. They give the pilot real confidence in landing, and sensitive control in every ground manœuvre.

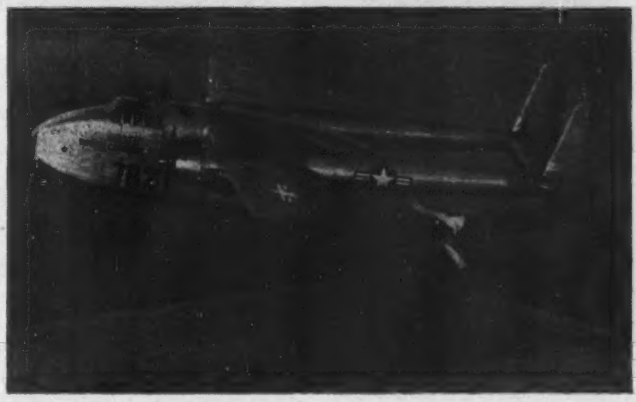
Here again, Goodyear Research and Enterprise are far in the lead.

GOODYEAR
SINGLE DISC BRAKES

★ UTMOST RELIABILITY ★

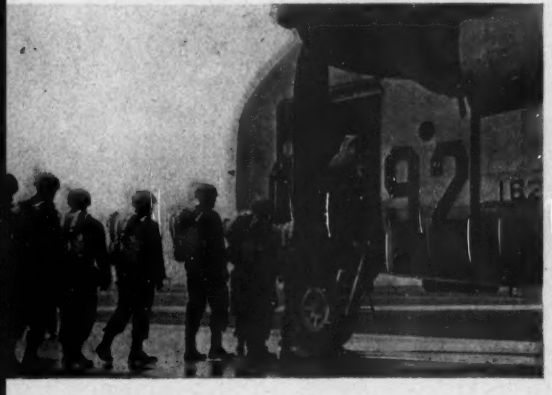
CO-OPERATIVE AIR SUPPORT

From an R.A.F. Hastings and two U.S.A.F. Packets some of the 100-odd paratroopers "hit the silk" over Watchfield. Right, a gravity-ejected jeep goes over the sill of a Packet. Below, British paratroopers file aboard a Packet for the mass drop.



Normal dropping speed is about 115 kt.

Though we were unable to verify it from our own observation, three "drifters" (instructors from No. 1 Parachute Training School) were dropped by the formation on a preliminary run over Watchfield to check wind strength and direction. At take-off the wind had been strong and gusty, and there was some fear for the success of the main drop; but in the event everything went well, and we duly watched 104 paratroopers "lob out" from the three massive fuselages. They left at such a rate that (as we subsequently learned from F/L. L. Henson, D.F.C., the Hastings pilot) the whole formation landed in a stick-length of 800 yards. Including the "drifters" 30 men were put down by the Hastings; one Packet dropped 40, and the second Packet (carrying a supplementary load of 10 panniers, which it dropped, through trap-doors, on an individual run) contributed 37.



It was not possible, due to restrictions on vision, to follow the whole progress of subsequent items, but these all appeared to go according to plan. The Hastings put down 24 internally stowed panniers and 20 externally slung containers—all with coloured parachutes—and a Packet used gravity to eject a jeep, trailer and gun from its yawning rear exit. (The aft portion of the fuselage is divided on the centre-line, the halves being hinged outwards or removed for dropping or loading.) A point of special interest concerning this drop was that the loads and parachutes were secured to "skid boards" under the wheels. This method, which is not generally used by the U.S.A.F. but has been developed successfully by the British Services, obviates provision of special strong-points on the loads. Standard British roller-conveyors were used for this drop. They differ from the American type in that the rollers are of uniform diameter, whereas the Americans use rows of roller-skate wheels.

A "paratechnicon" (a universal freight container weighing, loaded, some 8,300 lb) was released by a Halifax—a type which is still unsurpassed for the purpose. The loads in this monster container were a jeep and a gun. Eight main parachutes are required.

Before the main demonstrations began, the spectators saw instructors jumping from a balloon (still a most valuable training aid), and finally, Mr. C. I. Hosegood, of the Bristol Aeroplane Company, showed them what the Bristol 171 Sycamore helicopter has to offer military, as well as civil, users. Service pilots acclaim its handling qualities.

. . . from the House of Commons Debate on the Air Estimates, 1951-52

F-86 Venom

DEFENCE DEBATE DIGEST

Mr. Arthur Henderson said:

We have embarked on the most exacting expansion programme for the R.A.F. that has ever been undertaken in peace. Air strength has been given first priority in our defence system.

I doubt if there is any occupation that calls for a greater combination of mental and physical qualities than that of a pilot or navigator in the Royal Air Force today.

. . . the first Canberra squadron will shortly be formed. This squadron will be the forerunner of the large light-bomber force which will be equipped with the Canberra. In due course we shall have photographic-reconnaissance squadrons equipped with the Canberra. Today there are more man-hours in the twin-engined Canberra than in the four-engined Lancaster . . .

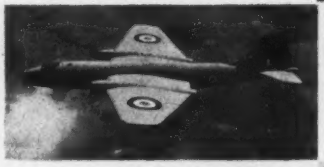
This aircraft (the first British four-engined jet bomber, for which Mr. Attlee announced a production order on January 29th), which will soon be flying, will be faster than the Canberra and will be greatly superior to it in load and range.

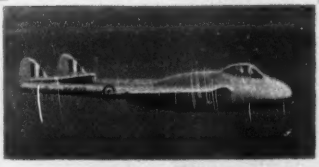
Sunderland flying-boats, two squadrons of which have been giving good service in Korea, will continue to be used for some time yet; but a replacement is under consideration.

We plan greatly to expand Coastal Command during the next two years, during which period it will also be largely re-equipped . . . A number of medium-range reconnaissance squadrons will also be formed (in Coastal Command). They will be equipped initially with P2Vs, or Neptunes, which are being supplied from America.

It is intended that the remaining five squadrons (R.Aux.A.F. not so far re-equipped with jets) will be re-equipped with Vampire 5s in time for them to carry out their training this year.

A number of squadrons equipped with . . . the N.F.11 will be formed within the next few months.





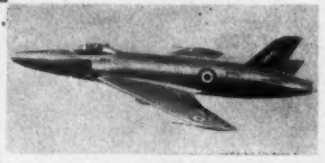
⇐?4-jet bomber ⇑Shackleton 1081⇒

⇐ Canberra ⇑ P2V 535 ⇒

⇐Sunderland ⇑N.F.11 Mig 15⇒

⇑ Vampire 5

our firms and one in Australia are to build the Canberra, but we must not lose sight of the fact that the Canberra is classed as a light bomber, which necessarily means that either the range or the bomb load must be very limited.



A. Cdre. Harvey said:

It is obvious that at the moment there is a shortage of practically all aircraft and equipment. This is the penalty for neglect and lack of foresight, in the last 3 or 4 years.

Mr. Anthony Eden said:

Presumably we are ordering the Sabres because they are better than the aircraft we have got now.

We welcome the news that four of our aircraft are convinced that a strong bomber force is an effective deterrent, and I believe myself that they are right, especially in the conditions now developing.

Mr. P. B. Lucas said:

. . . it appears that the Russians have had swept-wing fighters of an advanced design, with all that that means . . . in service for nearly two years. Yet at this time the Royal Air Force . . . has no British swept-wing fighter in squadron service.

It is my own information that they (the British aircraft industry) have already found the answer in the fighter field with the development of the Hawker 1081 and Supermarine 535.

Mr. Aidan Crawley said:

On the experience that we have so far, not only have aircraft exactly or nearly comparable to those we are using fared well against the Russian Mig-15, but no aircraft that the Americans have put up against them have appeared to be outclassed.

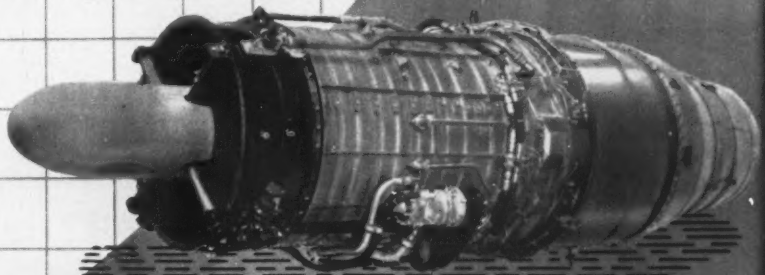
The picture I have tried to paint shows not only that we are expanding our Air Force at the right time in the right way, but we have, in fact, a very high-quality Air Force which is capable of further expansion and improvement and is a real deterrent now to any aggressor.

ARMSTRONG SIDDELEY GAS TURBINE DEVELOPMENT

low specific weight

7,200 lb thrust for 2,500 lb net dry weight

equals a specific weight of 0·347 lb/lb thrust



Armstrong Siddeley

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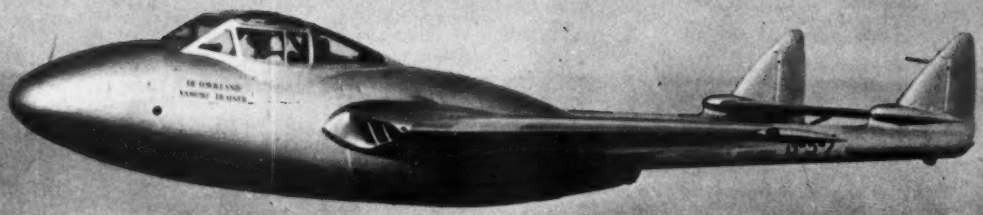
ALREADY 7,200 lb THRUST

ARMSTRONG SIDDELEY MOTORS LIMITED, COVENTRY. Members of the Hawker Siddeley Group

For rapid squadron-building

in a time of danger



VAMPIRE all-purpose

Jet TRAINER

THE DE HAVILLAND AIRCRAFT COMPANY LIMITED

BRISTOL 173

New British Twin-Engine Twin-Rotor Helicopter of Outstanding Promise: Design Analysis

WITH the introduction of their new twin-rotor model 173, the Bristol Aeroplane Company are setting a standard in the helicopter field which, in our view, cannot fail to become a norm which will have to be accepted by other manufacturers of helicopters throughout the world—at least for helicopters intended for commercial operation.

The formula is beyond question right, but this is not to say that it is the only right formula. An absolute prerequisite of any helicopter intended for the normal routine carriage of passengers or goods over built-up areas is that it should have more than one engine. So much is stated by the Ministry of Civil Aviation Helicopter Requirements which, it is thought, will more than cover the requirements yet to be enunciated by I.C.A.O. The 173 is, therefore, likely to be the first primarily civil rotary-wing aircraft in the world to meet what are foreseen to be the international standards: an example of prescience which we are glad is British.

In the tabulations of estimated performance given on a later page, it is evident that the 173 will be a fast aircraft as helicopters go. A speed of 164 m.p.h. is extraordinarily fast for a rotary-wing type, even although restricted to a five-minute limit, but even more astonishing is that the 173's maximum continuous cruising speed is in fact 5 m.p.h. faster than the present world's speed record for helicopters.

By the use of two engines—and, more particularly, by the drive-transfer system employed—the engine-failure safety problem has been reduced to small proportions. If one engine fails during flight, both rotors continue to be driven smoothly and without hiatus by the remaining live engine. Height can be maintained on one engine alone, except in the hovering case, and in effect this means that, although the pilot would doubtless wish to make a landing on experiencing engine failure, he can choose his time and place and make the landing more or less at leisure. In the unlikely event of both engines failing (each has its own fuel tank), the high-inertia-high-r.p.m. rotor system used will give the pilot the unusually long "action-period" of about four seconds in which to go into autorotation—a very valuable feature.

In view of how apposite the new Bristol 173 is to the immediate future of helicopter operation, not only in this country but without doubt in many other countries as well, it is thought worth while to depart slightly from our established practice in making design analyses, and to include a brief survey of the potential future of rotary-wing aircraft before going on to examine the factual details of the 173 itself.

Since the granting of the world's first commercial licence—to the Bell Model 47 on March 10th, 1946—rotary-wing aircraft have been used in numerous route trials and experimental mail and passenger services in the United Kingdom, Europe and the United States. In this country B.E.A. were early in the field (1948) with dummy mail services in Dorset, and later in the Peterborough district, using Sikorsky S-51s. During the following year, experience was also gained in operating by night in this same area.

The greater resources of the United States have allowed experimental services to be undertaken on a more lavish scale and, in fact, the extensive trials were soon turned into regular scheduled services. In Los Angeles and Chicago particularly, extensive networks of mail services have been flown daily for the past two years; these have yielded a wealth of data.

The honour of claiming the world's first scheduled passenger service, however, went to Great Britain when B.E.A. inaugurated a service (again using American-designed/British-built S-51s) between Cardiff and Liverpool last year. On the Continent, a number of unscheduled services have been introduced, notable among them being the Helicop-Azur taxi-flights—with Hiller 360s—from Nice to points on the French Riviera. The Hiller 360 is also being used by Sabena for experimental mail flights.

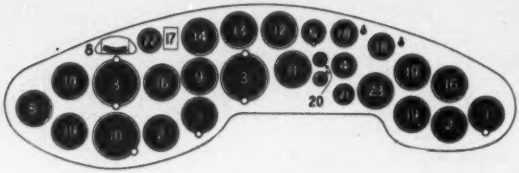
In the United States it seems there has been rather more reluctance to undertake passenger operations on a regular basis, and it is only recently that applications for the approval of this type of traffic have been submitted to the C.A.A. The desirability or, it might even be said, the inevitability, of using the helicopter as the speediest means of transport over short stage-lengths between large cities, or as a feeder link with major airport terminals is, of course, obvious. The elimination of time-consuming embarkation and disembarkation facilities (including transport to and from the airport) gives the helicopter a greater "effective transport speed" between two points. As we know these aircraft at present, design limitations would seem to preclude any increase in cruising speeds over about 170 m.p.h. and, on the basis of this fact, it has been calculated that the helicopter's best application is over distances between 50 and 300 miles, with 150 as the ideal stage-length.

Apart from the obvious requirements of economy, the successful commercial helicopter must also be equally acceptable from the standpoints of safety and regularity, and it is mainly towards these ends that present development work is being directed. As the helicopter will operate largely from confined spaces in built-up areas, the necessary standard of safety is high, and while the twin-engined configuration will ensure adequate safety from the performance viewpoint, a large amount of research still remains to be carried out in the operational and traffic control problems involved during landings and take-offs in low visibility. It is implicit that if the helicopter is fully to achieve the popularity which its capabilities seem to merit, it must continue to operate in all but the very lowest weather minima.

From the viewpoint of pure economics the present-day helicopter is not attractive. One reason is found in its high initial cost and another in its limited payload. Even so, there are indications that a competitive design intended for short-haul work would gain a considerably larger market than a conventional aircraft designed for the same purpose, and would thus prove to be cheaper.

Where actual running costs are comparable it has been calculated that the operations of a helicopter would result in a considerable saving on overheads as compared with the use of orthodox aircraft. However, with its lower percentage payload and lower cruising speed, the helicopter gives less ton-mileage for a given period of operation; despite the lower operating costs, therefore, the helicopter's freight and passenger rates would apparently need to be slightly higher than those for the fixed-wing types. Operating costs varying from 4s to 7s per ton-mile are envisaged (depending on whether operations are unde-taken on a large or small scale), a rate which seems sufficiently attractive for the helicopter to achieve a large measure of popularity. Fares generally may be slightly higher than first-class rail fares, but services would cater for passengers to whom time is the deciding factor.

It has been estimated (by Mr. Raoul Hafner) that, when the rotary-wing aircraft is adequately developed, 40,000 helicopters of all types would meet the requirements of the United Kingdom, and that the annual distance flown would add up to about 2,000-million aircraft-miles. From this estimate it is obvious that the possible high demand for the helicopter could result in a drastic lowering of initial cost, and in countries where the tempo of living is influenced by the



The instrument layout is an attempt at providing the helicopter pilot's ideal.

Key:—
1. Altimeter
2. Air-speed indicator
3. Artificial horizon
4. Air pressure (clutch)
5. Boost gauge
6. Clock
7. Compass
8. Cross level
9. Cylinder temp.
10. Directional gyro
11. Fuel contents gauge
12. Fuel pressure gauge
13. Oil pressure (engine)
14. Oil temp. (engine)
15. Oil temp. (gearbox)
16. Rate of climb
17. Suction gauge
18. Ammeter
19. Tachometers or decometers
20. Fuel warning lights
21. Clutch control
22. Bearing temperature warning
23. Boost or decometer

BRISTOL 173 . . .

constant need for greater speed, helicopters will undoubtedly provide the most economic means of transport.

So far as the Bristol 173 is concerned, it was some time ago that the company foresaw that a multi-engined multi-rotor machine would need to be developed if ever the helicopter was to be lifted out of the "interesting experiment" category. Mr. Raoul Hafner and his team therefore focused their attention on producing a design study which, whilst meeting the basic requirements, would at the same time make maximum use of the data established with the 171. Having decided on fundamentals and essential form, Bristols put up the proposal to the M.o.S. : a specification was written, a development contract issued and work on the 173 began. Today, the first flight tests with the prototype are expected to start shortly.

Physically, as may be seen from the illustrations, the aircraft has a neat and plainly functional appearance. Essentially, the layout could not well be simpler : there is a two-seat cockpit up at the front, a forward engine-room, a long, roomy cabin and an aft engine-room. In planning the aircraft, the collaboration of the Ministry of Supply, all branches of the Services and British European Airways was engaged in order to fit the helicopter to meet the widest possible ambit of operational requirements. The first prototype will be used chiefly to prove the configuration. The second aircraft, however, should be fully representative of the production type, and it is at present intended that the first 173 to go into operation will be used by B.E.A. for operational investigation of Orkney-Shetland and similar routes. So far as is now known, the aircraft will ably meet all the B.E.A. helicopter requirements although, naturally enough, a few minor changes may have to be made in the light of practice.

It goes without saying that such an aircraft as this will be well-fitted to a wide variety of Service rôles. For example, 18 airborne troops could be carried; for ambulance work ten stretcher cases or ten sitting cases or combinations of each could be accommodated; for air/sea rescue work, the aircraft is a "natural," whilst other rôles which spring immediately to mind are freight carriage, radar calibration, photographic, signal-line laying, mobile crane and, of course, air observation post. It is also evident that for all the additional variety of less punitive specialized jobs which the helicopter does so well—crop-spraying, mountain rescue, short-haul air mail, freightage over difficult terrain and the like—the 173 offers unique capabilities.

The fact that structurally the aircraft approximates to a large-diameter tube supported at each end both whilst in the air and on the ground means that the structure-weight case is eased, and this is reflected in the, at first sight, surprisingly light gauges of the structural elements. Weight has, in fact, been severely monitored throughout the whole design of the aircraft, and to this must largely be attributed the excellent disposable load figure of something over 51 per cent. The airframe is a semi-monocoque of basically ovoid section, made up by 22g, Z-section frames at 15½in pitch notched for 22g, Z-section stringers at 4½in pitch. On this skeleton is carried skin panelling of D.T.D. 710 duralumin, varying in gauge between 18 and 26, lap-jointed horizontally and butt-jointed vertically. In structural composition this is undoubtedly the most simple all-metal multi-engined 13-seater aircraft ever built.

In making an examination of the aircraft, the most straightforward attack is certainly to work through the design from front to rear, separating out the power installation and rotor systems for subsequent individual analysis. On this basis, then, the cockpit takes precedence. Bristols took an unusual amount of care in planning the 173 cockpit; they consulted every source of informed opinion they could think of and, as a result, the aircraft is furnished with a control cabin which is, in effect, a synthesis of everything that a wide variety of helicopter pilots could desire. Dividing the captain's seat (to port) from that of the second pilot is a console for engine ground-running, trim and bias controls. The primary flight controls comprise a collective-pitch lever, convenient to the left hand of each pilot, a cyclic-pitch lever in the conventional control column position, and "rudder" pedals in which are vested yawing control. Control transmission and the distribution of control function between the rotors will be dealt with on a later page. The instrument layout, as may be seen from the detail drawing, is unusual; nevertheless, it is the arrangement chosen by the majority of pilots consulted. It will be noted that alternative provision is made on the panel for decometers, and in this connection, provision is also made for a Decca Flight Log display head to be installed at the forward extremity of the central control console.

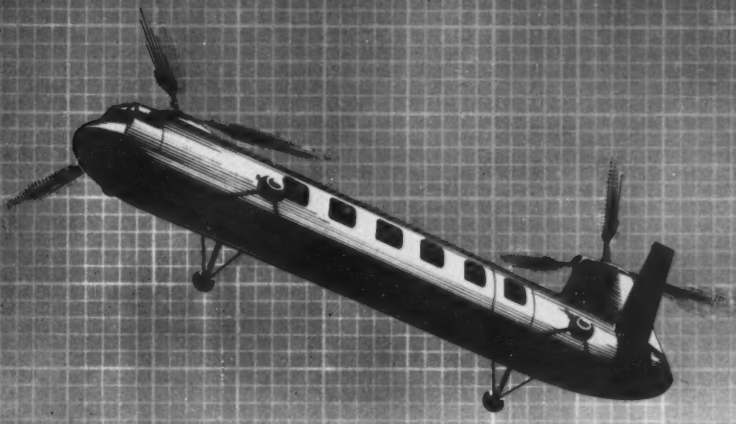
Although by comparison with many other (but smaller) helicopters, the cockpit glazing of the 173 does not appear lavish, in actual fact the void area is generous. With the exception of the front screen, which is of Triplex, the cockpit glazing is entirely Perspex. Both pilots' doors are flush-closing toggle-and-runner hung sliding units. Stowage is provided for radio and associated equipment in standard racks on the cockpit bulkhead behind the captain's seat. The central portion of the bulkhead takes the form of a vertical box conduit enclosing the flying control transmission, whilst on the starboard side, behind the second pilot's seat, a folding door gives access through the bulkhead to the forward engine room. This compartment is divided from the main cabin by a diaphragm bulkhead stabilized on its rear face by a grid of channel-section members : a small doorway in the centre of the bulkhead provides for emergency access between the forward part of the aircraft and the main cabin.

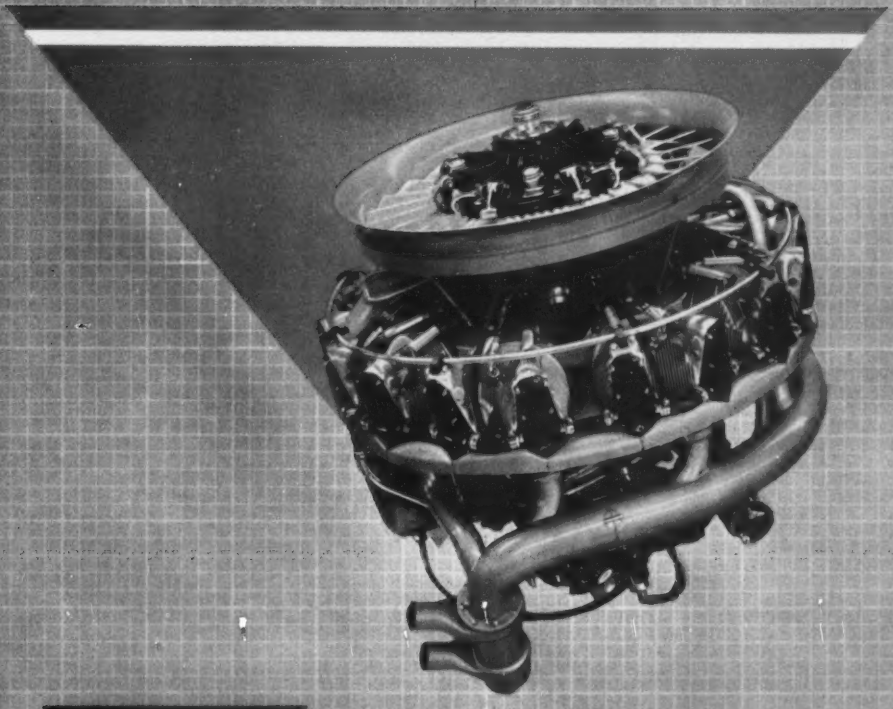
The forward Leonides 23 HMV 550 h.p. helicopter power plant is mounted with its crankshaft axis tilted forward five

Structurally, the fuselage is extremely simple and is provided with escape hatch/windows of unusually generous area.

The new BRISTOL 173 Helicopter fitted with two ALVIS LEONIDES engines

FLIGHT, 16 March 1951





ALVIS

LEONIDES

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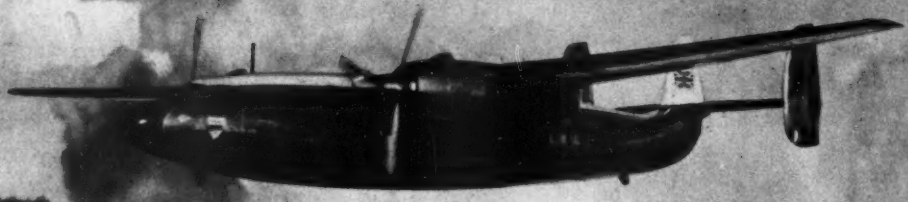
The successful operation of any civil aircraft depends largely on its capacity for further development. The Ambassador will enter airline service with a payload/range performance which, good though this is, by no means represents its ultimate possibilities in either piston-engine or turbine form



AMBASSADOR

BRITISH EUROPEAN AIRWAYS' *Elizabethan* CLASS AIRLINER

AIRSPEED LIMITED, CHRISTCHURCH AND PORTSMOUTH, ENGLAND

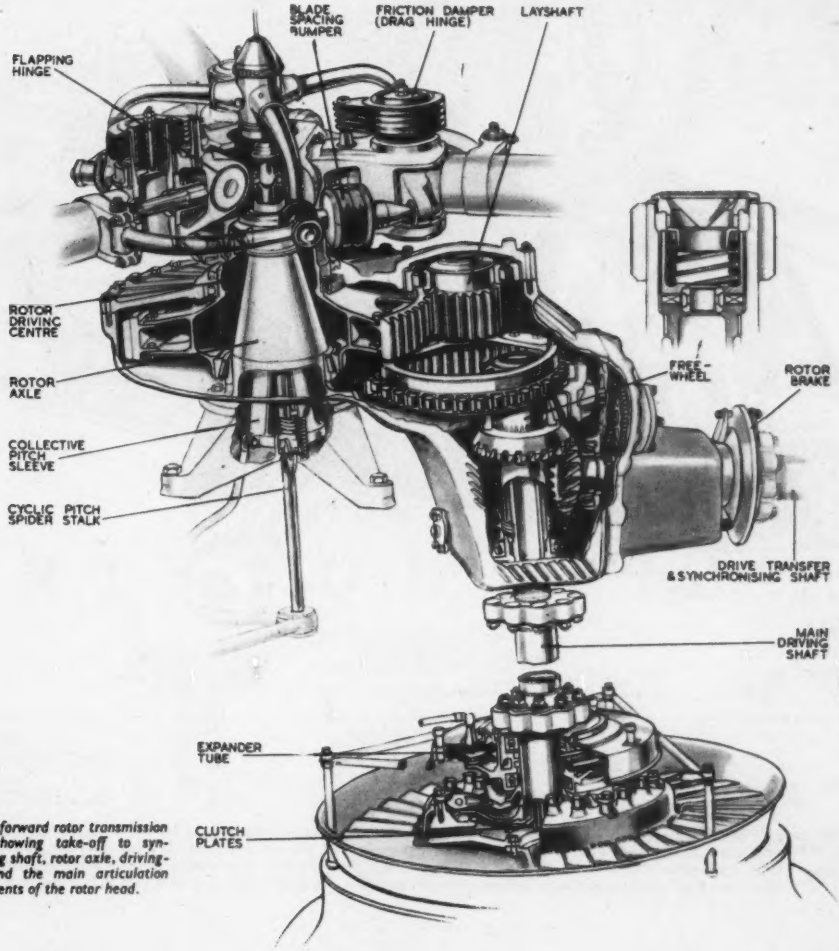
In association with the de Havilland Enterprise

BRISTOL 173 . . .

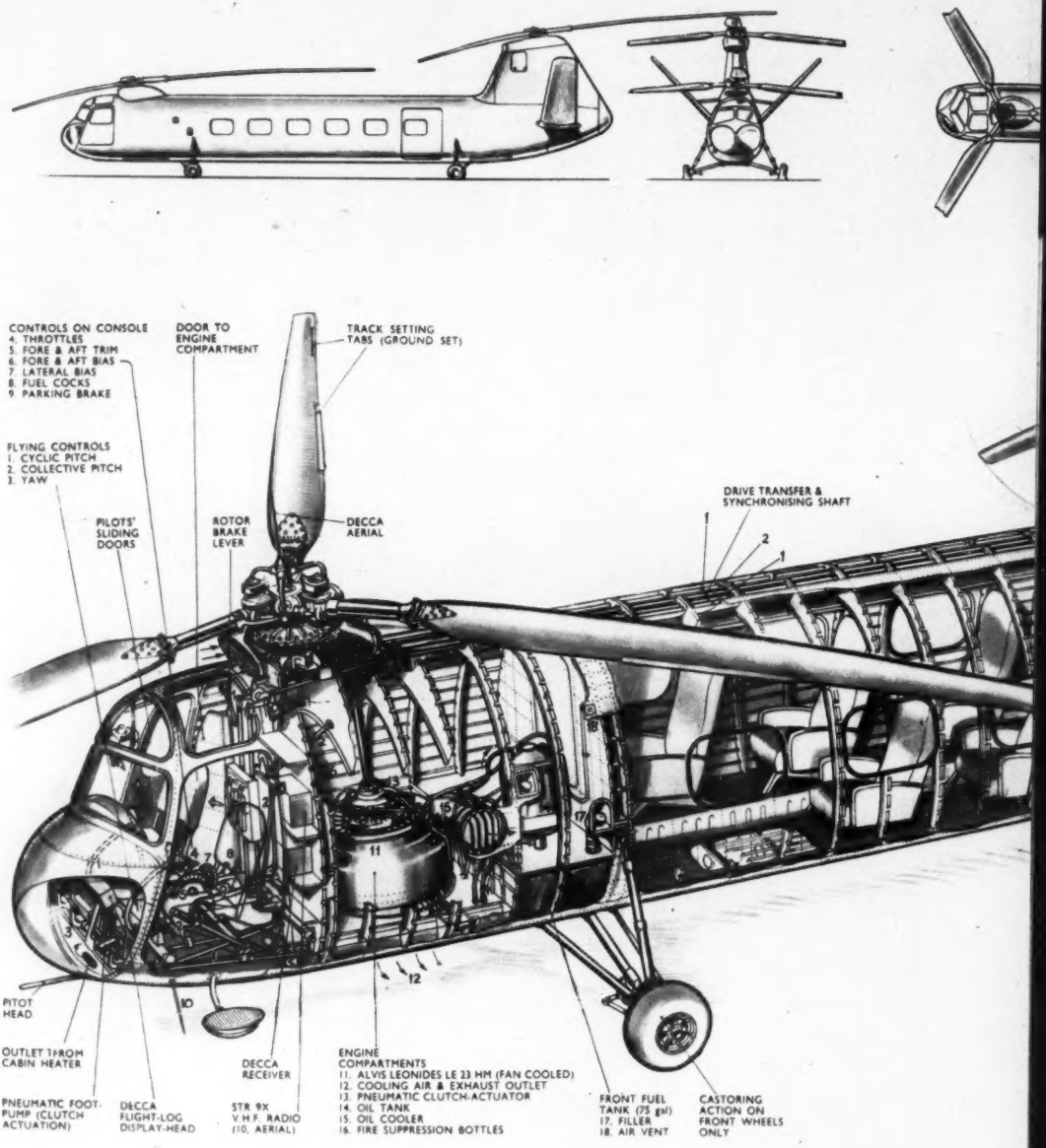
degrees from the vertical, and is carried in a triangulated star-truss mounting of steel tubes, the terminals of which pick-up at Dynafocal a.v. mountings in the floor structure. The engine fire zone is bounded by the engine cowling itself, the steel floor of the engine compartment, the lower rear face of the front bulkhead, the inboard faces of the engine-support keels, and the front face of the lower (under-floor) section of the tank-cell front-support frame. Nominally, the forward engine draws its fuel from its own 75-gallon Fireproof bag-type tank which is housed in a cell spanning the engine room immediately forward of the cabin bulkhead; a cross-feed cock, however, makes it possible to supply either engine from either fuel tank. On the port wall of the engine room, immediately above the fuel cell, is mounted the oil tank, and on the rear face of the cockpit bulkhead are carried the Graviner fire-suppression bottles which discharge both into the engine room itself and into the carburettor intake.

Along the full 26ft length of the cabin run a pair of keel beams with swage-stiffened diaphragm webs and rolled-angle booms. These beams are spaced 14in apart about the centre-plane of the fuselage and form a 9in-deep well, running between the seat floors. These latter are 18in wide, but the ovoid section of the fuselage permits chairs of comfortable dimensions to be fitted, in that the widest part of the fuselage (5ft 3in) occurs at a height of 16½in above the seat floors, and 3in below the sill line of the windows. Each window is effectively an escape hatch. Glazed in ¼in Perspex, the windows are of unusually large area (28in x 18in) and are given their escape-hatch function by virtue of the method of framing employed. This is essentially similar to the method now used so widely for cars and buses, and consists of an extruded rubber H-section frame, locked by a rubber filler-strip. By making the frame in upper and lower halves with the filler-strip for one half on the outside of the aircraft, and for the other half on the inside of the cabin, the window can rapidly be removed in an emergency by ripping out the tab-ended filler-strip and pushing the window free.

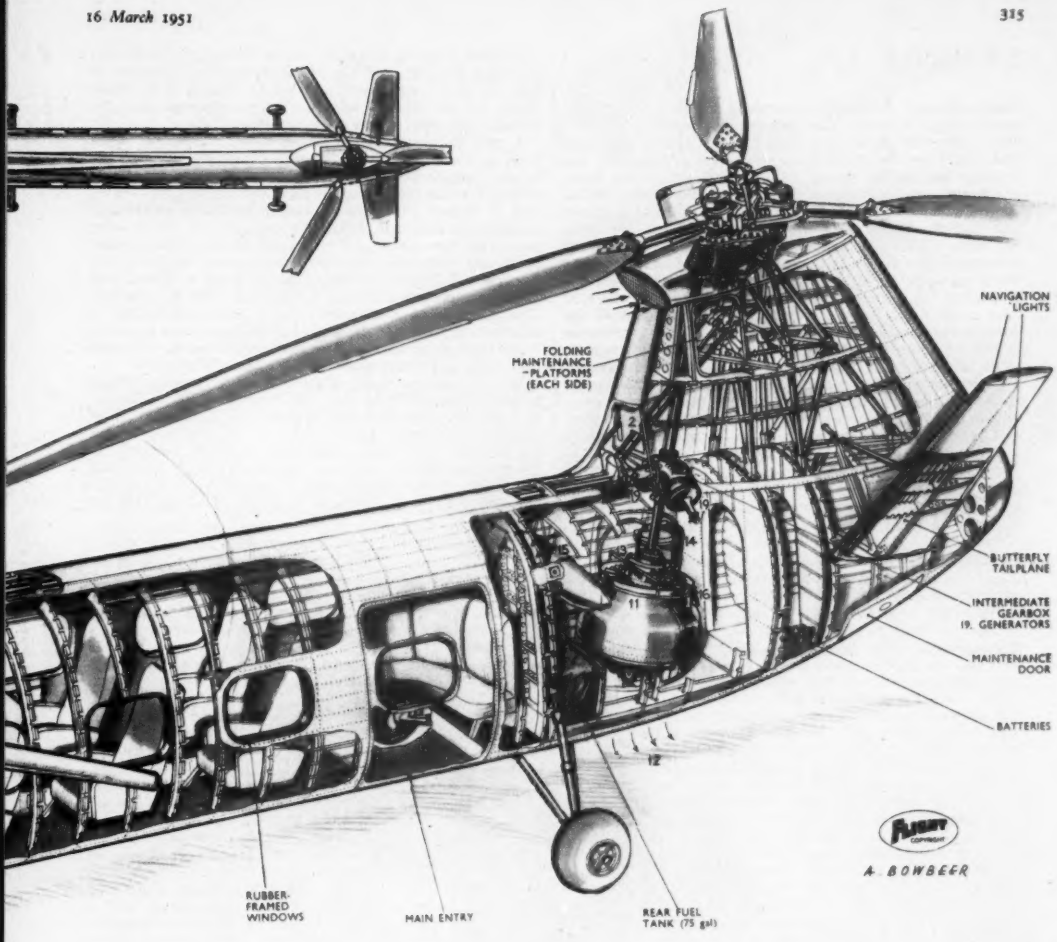
In the suggested B.E.A. version of the aircraft, ten seats are pitched in abreast pairs, so that the passengers' heads align with the rear of the windows, and in the starboard rear corner of the cabin is fitted a quadrantal bench seat to accommodate three passengers. The seats are of Bristol design, and comprise a light alloy tubular frame upholstered either with Hairlok or Dunlopillo, which will be covered either with fabric or leather-cloth according to the furnishing scheme



Detail of forward rotor transmission system showing take-off to synchronizing shaft, rotor axle, driving-centre and the main articulation elements of the rotor head.



THIS special "Flight" drawing by Arthur Bowbeer illustrates the fundamental simplicity of the 173. Each rotor is nominally driven by its own engine, the forward unit rotating anti-clockwise in plan, the rear unit rotating clockwise; but in the event of an engine failure both rotors will be driven by the remaining engine. Alternatively, auto-rotation descents are possible and, in this context, the high inertia of the rotor systems gives the pilot the relatively lengthy action period of four seconds.



BRISTOL 173...

BRISTOL 173 DATA

Two Alvis Leonides LE 23 HMV Mk 73 Engines, each of 550 b.h.p.

All-up weight	10,600 lb	Wheelbase	26ft 5in
Power loading	9.64 lb/b.h.p.	Track	9ft 6in
Overall length (blades folded)	78ft 2in	Design sinking speed (emergency)	10ft/sec
Overall width (blades folded)	17ft	Vertical travel	12in
Fuselage length	55ft 1.7in	Total rotor disc area (2 x 1860)	3,720 sq ft
Rotor centre-to-centre	40ft 7.61in	Disc loading	2.85 lb/sq ft
Overall height (blades folded)	15ft	Solidity at 0.75 R	0.0294
Rotor diameter	48ft 6.7in	Coning angle limits	—8 deg
Cabin length	26ft 2in		+22 deg
Cabin width (max)	5ft 3 in	Drag angle limits	±12 deg
Cabin height (in walk-well)	5ft 8¾in	Maximum rotor r.p.m.	267.5
Fuselage volume (freighter version)	605 cu ft	Maximum w.m. cruising rotor r.p.m.	226
Fuselage wetted area	985 sq ft	Maximum tip-speed	680ft/sec
Tailplane area	48 sq ft	Cruising tip-speed	575ft/sec

BRISTOL 173 . . .

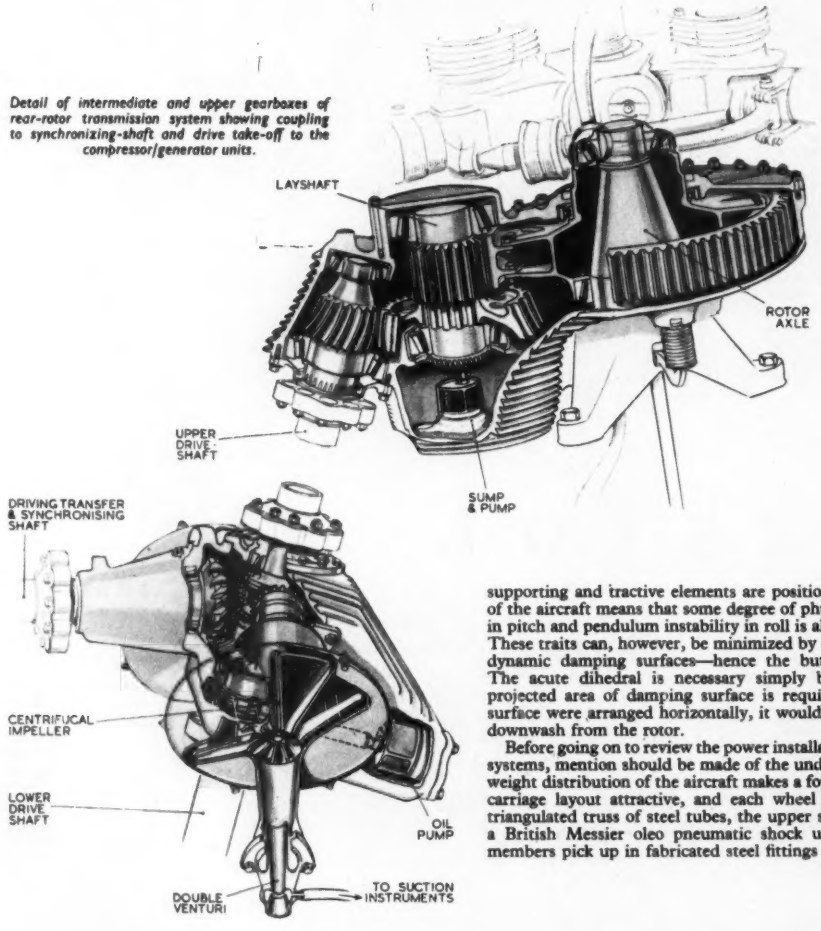
finally adopted. Each seat is anchored at four points to the seat floor and is stressed for six *g* forward and four *g* downward. The entry door is particularly large in being 54in high and 44in wide, but these dimensions were governed by the freighter and similar version requirements rather than those of even the most portly passengers. It is worth noting in this context that the door threshold is only 28in above the ground and that the cubic capacity of the cabin is no less than 630 cu ft, which figure is reduced only to 605 cu ft by covering the central floor well, a measure almost certain to be followed when the aircraft is used for cargo-carrying and allied duties. Headroom from the floor well to the underside of the roof duct is 5ft 8¼in. The roof duct is an integral part of the fuselage roof, and is thus a stress-bearing part of the structure. It accommodates the rotor drive-transfer and synchronizing shaft, and the push-pull tubes of the control transmission, together with electric cables. The cover doors each extend over three rib-bays and, secured by Oddie fasteners, comprise a flush outer skin, Redux-bonded to a corrugated inner skin.

The fact that along the whole length of the cabin roof runs a shaft and that at each end of the cabin is an engine compartment, would seem to make it inevitable that the sound insulation problem will be one of some considerable magnitude. Fibreglass blanket is the specified sound-absorption material; this is, of course, a wonderfully efficient insulating medium, and it is extremely fortunate that it is so light, for we are quite convinced that the amount of insulation which will be required will be a good deal more than the normally accepted standard for aircraft practice.

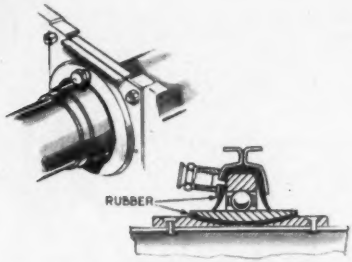
A grid-stabilized diaphragm bulkhead divides the cabin from the rear engine room, which is essentially similar to its forward complement, with the exception that the fuel cell is arranged across the base of the forward bulkhead, and the oil tank is stowed on, and its cooling airflow is discharged through, the starboard wall of the compartment. In the after part of the rear engine room are a pair of double-wall frame-bulkheads which are the stress-distributing media for the rear rotor loads, transferred down through a triangulated tubular supporting structure carrying the rotor and gearbox. The rear member of this tubular pylon picks up at the foot to a further diaphragm bulkhead in the fuselage tailcone. A door in the flank of the tailcone gives access to the rear engine room and to the additional space available here for stowage.

In order that the blades of the rear rotor, the axis of which is tilted forward, shall clear the fuselage it is, of course, necessary that the rotor hub be positioned fairly high. This expediency, however, gives a second-order advantage in that the fairing of the rotor-supporting structure becomes an effective fin and thus serves as a deterrent toward directional instability. Whilst on this part of the subject, it is apposite to refer to the 173's butterfly tailplane. The fact that the supporting and tractive elements are positioned at each end of the aircraft means that some degree of phugoid oscillation in pitch and pendulum instability in roll is almost inevitable. These traits can, however, be minimized by employing aerodynamic damping surfaces—hence the butterfly tailplane. The acute dihedral is necessary simply because a given projected area of damping surface is required, and if this surface were arranged horizontally, it would extend into the downwash from the rotor.

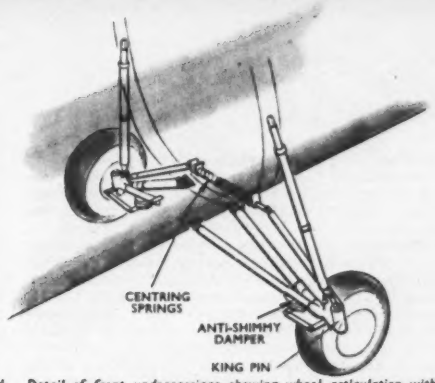
Detail of intermediate and upper gearboxes of rear-rotor transmission system showing coupling to synchronizing-shaft and drive take-off to the compressor/generator units.



Before going on to review the power installation and control systems, mention should be made of the undercarriage. The weight distribution of the aircraft makes a four-wheel undercarriage layout attractive, and each wheel is carried on a triangulated truss of steel tubes, the upper strut of which is a British Messier oleo pneumatic shock unit. The lower members pick up in fabricated steel fittings of fork/lug type



Synchronizing-shaft bearing showing how the sleeve-type inner-race and the bearing outer-race are both bonded to rubber cush-mountings.



Detail of front undercarriage showing wheel articulation with spring sleeve-centring and friction-disc anti-shimmy damping.

with high-tensile steel pins, whereas the head of the shock-absorber strut is anchored in a cast fitting of light alloy. Both the rear wheels are fixed, but the front wheels are free to castor, sympathetic motion being ensured by an articulated track-rod. Around the central length of the track-rod is a pair of coil springs, each of which is anchored to the rod at the centre and reacts against an end-stop to provide self-centring action. Friction-disc anti-shimmy dampers are connected to each front wheel through a drag-link and track-bar system. Only the rear wheels are fitted with brakes, and these are manually actuated from the cockpit.

By virtue of the fact that the power installation of the 173 is divisible into fundamentally similar halves, it is most conveniently described if we deal with the forward section as an entity, and, for the rear section, content ourselves with simply pointing out the details of design difference. The method of engine mounting has already been described, together with the fire zone aspects of the installation. A forward-facing intake in the rotor fairing vents into the engine room, and from this ambient volume the engine-fan abstracts air to force it as a cooling flow around the baffled cylinders, whence it is exhausted to atmosphere through a belly-grille beneath the engine. From the pressure delivery (downstream) side of the engine-cooling fan, a proportion of the air is ducted away for oil cooling and is exhausted to atmosphere through a grille vent in the port wall of the engine compartment (through the starboard wall of the rear compartment). Exhaust gases are collected in three manifolds, each serving three cylinders, which discharge through the belly-grille, together with the main engine-cooling air.

The cooling fan is a 24-blade unit, mounted on the periphery of the clutch. This latter is a single-plate spring-loaded Borg and Beck unit of normal road-vehicle type, but it is actuated in an unusual and ingenious fashion. It was considered necessary that the engine should be capable of being run without driving the transmission—in neutral, so to speak—and this made necessary a positively actuated, as distinct from an automatically actuated, clutch. Obviously, with so high an inertia system as a helicopter rotor, the clutch engagement and drive take-up is a somewhat tricky business from which, if possible, the human element could with advantage be excluded. To this end, therefore, in the 173 the clutch is pneumatically actuated. The captain has a foot pump (mounted between the "rudder" pedals) by means of which an expander tube can be inflated to throw out the clutch. To let in the clutch, the captain turns a small cock which evacuates the expander tube through a metering jet, so that the drive is taken up at a predetermined rate and snatch loads on the transmission system are therefore obviated. A micro-switch causes a warning light to glow in the cockpit, to prevent the engine being started with the clutch engaged.

Drive output from the clutch is given through an eight-point Layrub flexible coupling to the main transmission shaft which, through another eight-point Layrub coupling, transmits torque to the input shaft of the gearbox. This input shaft is crowned with a buttress-tooth coupling, the output half of which takes the form of a cup, spring-retained by a cap screwed in the mouth of a spur pinion shaft, coaxially surrounding the coupling. The output half of the coupling is helically splined to the bore of the pinion shaft, the spline helix ensuring that, as torque is increased, the coupling is fully engaged. The spur pinion shaft is carried in a Timken taper-roller bearing, immediately beneath which it is splined to the spiral bevel pinion through which is engaged the drive-transfer and synchronizing shaft. The spur pinion meshes with an internally-toothed ring gear which, in effect, forms the skirt of a bell-mouth at the base of a layshaft. The layshaft proper is splined to a spur pinion which meshes with a ring gear, the twin webs of which are bolted to what can best be described as the rotor driving-centre.

The gearbox casings are light-alloy castings, liberally finned to take the maximum advantage of the cooling air which flows past them from the intake to the engine compartments. The forward gearbox is bolted to a three-legged, steel, conical "axle," on which the rotor driving-centre is supported by upper and lower taper roller bearings with a central straight-roller steady-bearing to the gearbox. It is apposite here to point out that, throughout the power transmission system, all taper roller bearings are Timken components, whilst the straight-roller units are by Ransome and Marles; ball bearings are Skefko. The vertical cone axle which carries the gearbox and supports the front rotor is mounted on a triangular forging carried in the roof structure of the forward engine room between the cockpit bulkhead and a pair of ridge beams extending aft through three frames.

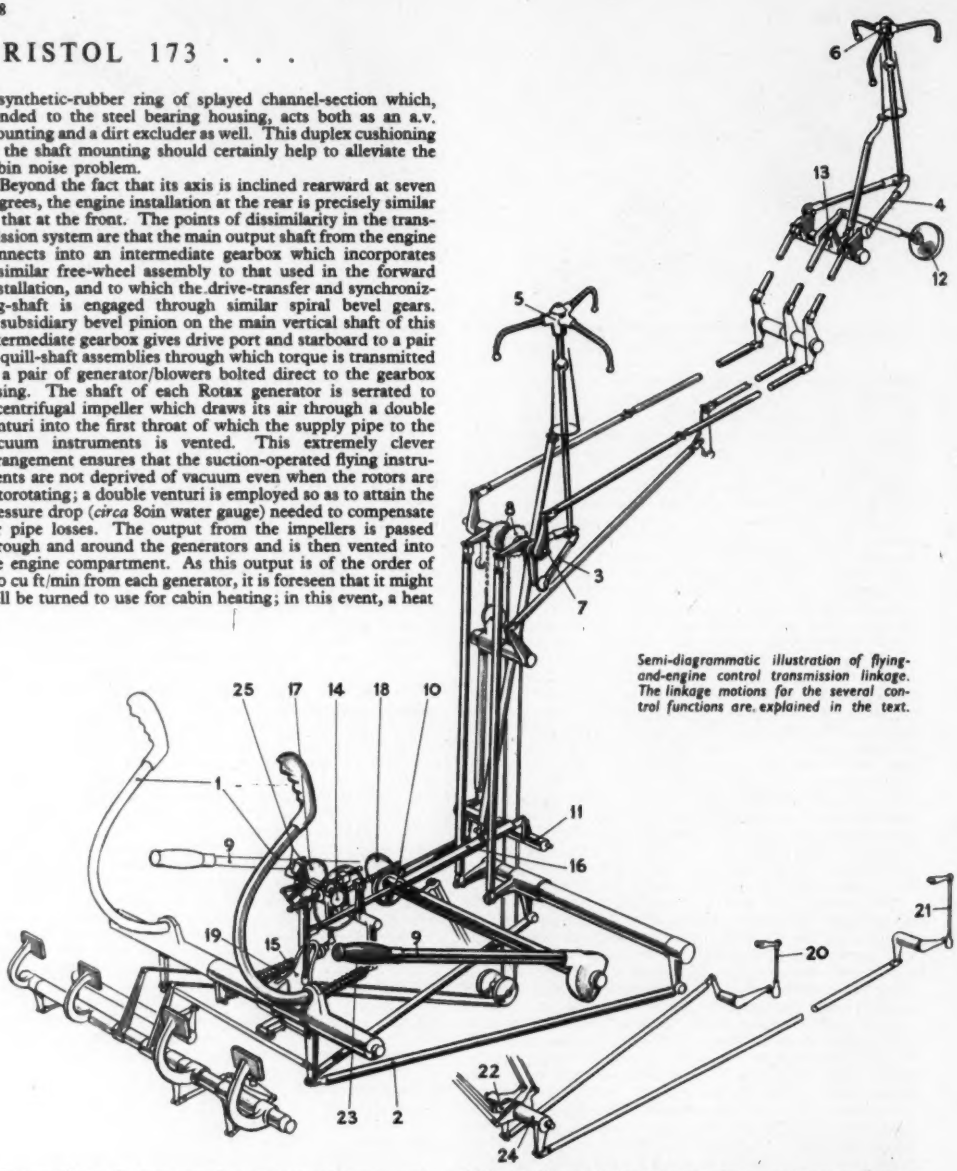
The take-off to the drive-transfer and synchronizing-shaft is at the rear of the gearbox, and is given through a spiral bevel shaft, housed in its own casing, which bolts on to the rear face of the main gearbox. This bevel shaft is carried in a pair of taper roller bearings, and drives for a tachometer generator and a vacuum pump are taken off the shaft by a spur train. Splined to the tail of the bevel shaft is a taper-rimmed "flywheel" against which a pair of Ferodo pads can be impressed for rotor braking. Brake application is performed manually, the brake lever being mounted on the cockpit bulkhead above the pilots' inboard shoulders. A five-point Layrub coupling connects the bevel shaft to the drive-transfer and synchronizing-shaft proper. In this context, it should be pointed out that the synchronizing shaft is not subjected to such torque variations as would justify the term "hunting," because parity of engine r.p.m. can be achieved at disparate power outputs and, of course, the free-wheels are concerned only with r.p.m. parity. The synchronizing-shaft is a two-inch diameter steel tube, its 36ft length being split into halves, spline-mated at the centre.

Weight reduction was responsible for the decision to make the shaft in two lengths rather than to break up the run into a number of smaller lengths, although this undoubtedly complicates the balancing problem. Balancing will, in fact, have to be carried out in relation to each shaft bearing, and although the fuselage will undoubtedly be relatively stiff, some degree of flexure inherent in the bearing and inner race design is a necessity to compensate for the small amounts of fuselage flexure which are inevitable. The design of the synchro-shaft bearings is ingenious. The shaft is supported at alternate frame stations (i.e., at 31in centres) and the inner race of each bearing takes the form of a sleeve, 1.6in long, coaxially surrounding the shaft and bonded to it through a cushioning, synthetic-rubber filling. The outer race of the bearing is conventional *per se* but, unusually, is held in

BRISTOL 173 . . .

a synthetic-rubber ring of splayed channel-section which, bonded to the steel bearing housing, acts both as an a.v. mounting and a dirt excluder as well. This duplex cushioning in the shaft mounting should certainly help to alleviate the cabin noise problem.

Beyond the fact that its axis is inclined rearward at seven degrees, the engine installation at the rear is precisely similar to that at the front. The points of dissimilarity in the transmission system are that the main output shaft from the engine connects into an intermediate gearbox which incorporates a similar free-wheel assembly to that used in the forward installation, and to which the drive-transfer and synchronizing-shaft is engaged through similar spiral bevel gears. A subsidiary bevel pinion on the main vertical shaft of this intermediate gearbox gives drive port and starboard to a pair of quill-shaft assemblies through which torque is transmitted to a pair of generator/blowers bolted direct to the gearbox casing. The shaft of each Rotax generator is serrated to a centrifugal impeller which draws its air through a double venturi into the first throat of which the supply pipe to the vacuum instruments is vented. This extremely clever arrangement ensures that the suction-operated flying instruments are not deprived of vacuum even when the rotors are autorotating; a double venturi is employed so as to attain the pressure drop (*circa* 80in water gauge) needed to compensate for pipe losses. The output from the impellers is passed through and around the generators and is then vented into the engine compartment. As this output is of the order of 150 cu ft/min from each generator, it is foreseen that it might well be turned to use for cabin heating; in this event, a heat



Semi-diagrammatic illustration of flying- and-engine control transmission linkage. The linkage motions for the several control functions are explained in the text.

exchanger either of exhaust-muff or surface-combustion type will be used.

From the intermediate gearbox the main power transmission up to the rear rotor gearbox is through an extension shaft, similarly mounted in eight-point Layrub couplings. Essentially, the gearbox for the rear rotor is similar to its forward complement, with the basic difference that the input is to a bevel shaft which transfers drive to the layshaft, and so eliminates the use of an internally-toothed ring gear. Immediately beneath the layshaft is a sump, the integral oil pump for which is driven by a short vertical shaft serrated to the heel of the layshaft.

An enormous advantage possessed by the 173, and one which should contribute in large measure to the early success of the aircraft, is the use, to a practicable maximum, of components already fully developed with the single-rotor 171 Sycamore. Beyond the fact that the rotors are handed (and thus the hub of the front rotor is a reversed image of that of the rear rotor), the detail design is identical with that of the 171. Since we described the 171 (October 30th, 1947) there have been only minor detail changes in the rotors which, briefly, are as follows: the blade shanks have been shortened 10in, and the six-segment tie-bars have been changed to eight-segment units in order to maintain the natural torsional frequency for the shortened length. Tapered pins are now used for blade anchorage to the shank to increase

the ease of blade folding, and the outer cover of the blade shank is now carried on needle-roller bearings instead of the caged-roller units previously used. Another innovation is that the basic pitch setting of the rotor blades is made by adjusting a screwed pin in the fork-end of the blade shank, the root-arm of the drag-link from the spider being carried on the screwed pin.

The blades themselves have been changed to a symmetrical-section, chiefly because the original reflex trailing-edge cambered blades were both difficult to make and suffered from weathering effects which changed their aerodynamic characteristics. The section now used is an N.A.C.A. 0015 at the root, which tapers to a 0006 at the tip; the blades are not high-speed sections, and their performance is virtually the same as their cambered predecessors. Structurally, they comprise a Hydulignum leading-edge spar with four-ply skins top and bottom in five spanwise panels with a spruce trailing-edge fillet. Chordal ribs have ply webs with spruce booms glued to the skin. Each blade has a pair of ground-setting track-adjusting tabs centred on the 130in and 258in radii; they are simply light-alloy strips, Redux-bonded and cold-glued to the trailing edge. At the leading edge, the blade skins are butt-faired to a brass leading-edge sheath, screwed to the spar and split diagonally into 4in lengths to permit blade flexure.

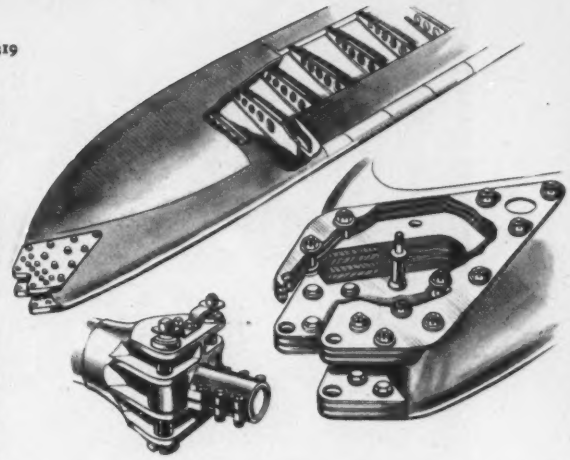
Although at first sight forbiddingly complex, the control system in the 173 can fairly readily be sorted out into its component elements. Before attempting this, however, the definition should be given that cyclic pitch involves a regular (sinusoidal) variation of blade incidence (or pitch) with azimuthal position of the blade: collective pitch involves a simultaneous variation of incidence (pitch) on all blades. The basic control requirements are as follows: (i) that both rotors can simultaneously be controlled in cyclic pitch to give the aircraft direction in flight; (ii) that the cyclic pitch of the rotors can be imposed differentially in order to give the aircraft a turning moment; (iii) that collective pitch in both rotors can be controlled simultaneously for ascending, hovering and descending; (iv) that trimming means are provided to control the attitude of the aircraft under varying load conditions; (v) that biasing means are provided to trim-out operating loads in the cyclic pitch lever; (vi) that the power of both engines is increased simultaneously with collective pitch (with an overriding control over a small range); (vii) that independent "ground-running" control of the engines is provided.

Cyclic pitch control is effected by the swan-neck column annotated No. 1 in the accompanying diagram. To the base of the column is attached a triangulated articulating mechanism (2) which operates by means of bell-crank levers and push-pull rods similar triangulated articulations (3 and 4) which pick up to the heels of the rotor spider stalks (5 and 6). Movement of the rotor spider stalks is sympathetic both in degree and sense with movement of the control column. Cyclic pitch control provides a blade incidence change of $+5$ degrees fore and aft, and ± 4 degrees laterally.

Yawing control is effected through the "rudder" pedals to impose differential lateral movement of the spider stalks. This is accomplished by mounting on eccentric shafts (7) the bell-cranks which actuate the articulation assemblies (3 and 4). The eccentric shafts are integral with chain sprockets (8), and thus by operating the yaw control pedals, the sprockets are rotated in opposite directions, so displacing the articulating mechanisms laterally but in opposite senses.

Collective pitch-change is effected through movement of the collective pitch lever (9), from the cross-shaft of which an irreversible unit (10) is connected to a T-lever system, mounted on an eccentric shaft (11). The forward arm of the T-lever is coupled direct by a push-pull tube to the front rotor control-sleeve in which is carried the control spider (5). The rearward arm of the T-lever is coupled indirectly through levers and push-pull rods to the rear rotor control-sleeve. Operation of the pitch lever will thus raise or lower both rotor spider assemblies simultaneously and by an equal amount, the range covered being 10 degrees of blade incidence change.

The purpose of the irreversible link (10) is to arrest any rotor vibration loads which may be transmitted into the system. Similar vibration loads in the rear rotor might lead to resonance in the lengthy control run back to the irreversible link, and therefore an inertia damper (12) is embodied to absorb any such vibrations near the source.



Detail of rotor blade construction showing method of anchorage to the tie-bar-and-sleeve blade shank.

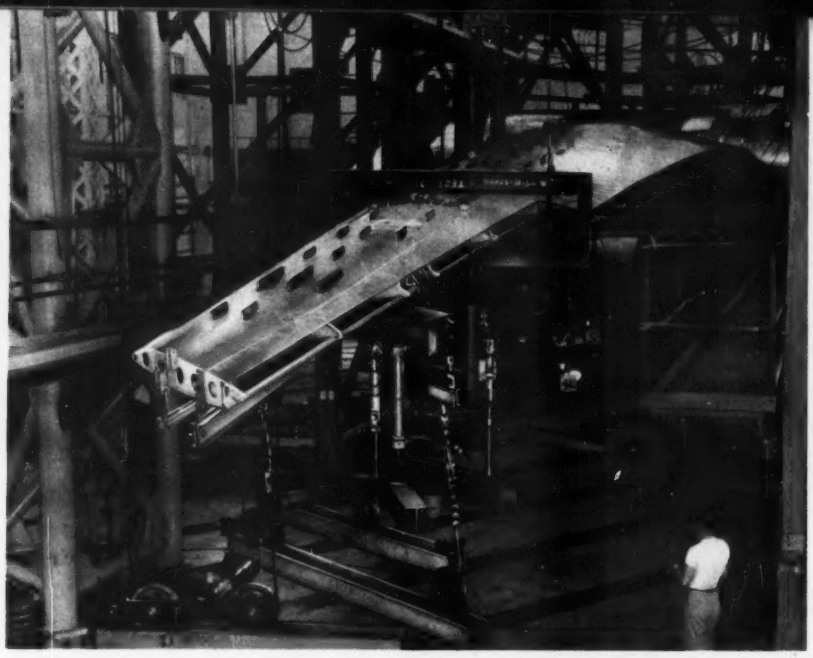
The ratio of front to rear rotor pitch-change provided by movement of the collective pitch lever(s) is nominally 1 : 1. Should flight-testing, however, reveal a nose-up or nose-down tendency in the aircraft when the pitch lever is suddenly raised or lowered, some adjustment to this basic ratio might be desirable. Provision for this is made by mounting the bell-crank (13) eccentrically, whereby the effective lever arm may be lengthened or shortened by $\pm 2\frac{1}{2}$ per cent.

Whilst simultaneous operation of collective pitch will affect only the height at which the aircraft is flying, a differential change of collective pitch will affect fore and aft attitude by producing more lift at one rotor and less at the other. This feature is used to provide longitudinal trim. Operation of the trim wheel (14) will, through cam assembly (15) and load-limiting strut (16), raise the front and lower the rear rotor control-sleeves (and therefore the spiders) or *vice versa*, by virtue of the fact that shaft (11) is eccentrically mounted.

As the attitude of the aircraft is affected, differential collective pitch will produce a forward or rearward thrust component which can be used to provide a powerful force either to accelerate or retard the aircraft. It is obviously advantageous to make use of this feature, and it is for this reason that differential-collective pitch change is interconnected to the fore and aft movement of the cyclic pitch control column. This cyclic/collective mixing is effected by means of the cam assembly (15) attached to the torque tube on which the cyclic pitch levers are mounted, and thus movement of the cyclic control column in, say, a forward direction will operate the eccentric shaft (11) in the same manner as the forward trim.

Rotation of hand-wheels (17 and 18) displaces the spring-bias unit (19) to trim-out the operating loads in the cyclic pitch control lever(s).

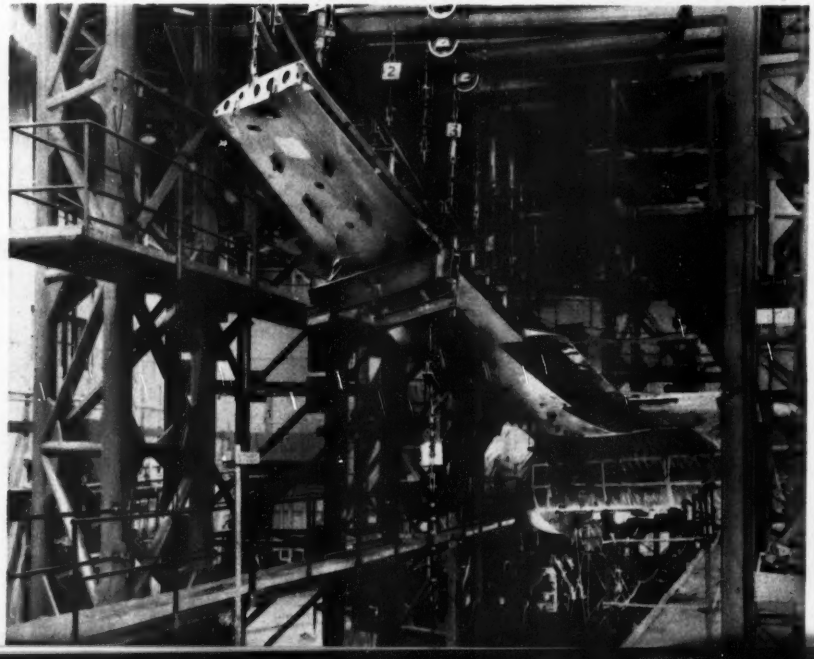
The engine controls (20 and 21) are normally operated through the bell-crank assemblies (22) by rotation of the twist-grip (23) or by movement of the collective-pitch lever. In this manner, a synchronized control over both engines is obtained. It is essential that either engine may be isolated during ground-running, and this is achieved by mounting bell-crank assemblies (22) on an eccentric shaft (24) and operating them *via* push-pull rods from levers (25) mounted in the control console. The levers are provided with a locating gate in the "flight" position only, and will return to it automatically, if not already so located, when the pitch lever is brought into operation. For ground-running, the collective pitch lever is locked in its minimum-pitch position with the twist-grip against its slow-running stop. Manipulation of the ground-running levers then permits either engine to be run at 67 per cent power, driving both rotors at minimum pitch and maximum r.p.m. C.B.B-W.



BOEING BENDS

THESE remarkable photographs make it plain, without recourse to mathematics, that the thin, swept wing of the Boeing B-47B Stratojet is a remarkably tough, resilient structure. The port section of the 116ft-span wing is seen during static tests at 100 per cent overload in Boeing's "torture chamber". In the lower view, the wing-tip has been deflected upward through a radius of 11ft; the picture above shows downward deflection of 6ft. At 119 per cent overload, when the first structural failure occurred, the total vertical bending movement was over 20ft.

This elaborate test-frame, situated in the Boeing plant at Wichita, Kansas, is a 700,000 lb steel structure mounted on a 2ft-thick reinforced concrete floor. The network is supported by seven steel towers, and stress is applied, through cables and pulleys, by 30 hydraulic rams actuated by 17 pressure-systems. Measurement of the forces applied to the wing is by electronic strain-gauges.



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WORLD-WIDE SERVICE

Shell Aviation Highlights: Providing Aircraft-fuel for over Thirty Years

IN almost every article on world flights or air tours that has appeared in our pages over very many years, some mention has been made of the services rendered by the ubiquitous "Mr. Shell," so the facts recorded in an historical review recently prepared by Shell-Mex and B.P., Ltd., came as no surprise. Nevertheless, most of them are of more than passing interest, and deserve placing on record; and certainly they constitute a very fair claim to leadership in this particular field.

The organization can claim to have provided fuel for aviators from the very earliest days of flying, and when officially instituted in 1919—long before any other oil company provided such facilities—the Shell Aviation Service quickly found custom among the world's pioneer airlines. One of the earliest was K.L.M., which soon expanded eastward to the Indies and found trained Shell staff already installed and ready to provide supplies at all the principal airports. In 1934, when Imperial Airways' through service began, the entire London-Australia route had been similarly staffed and equipped; by then an equally complete ground organization had been set up along the East Coast route to the Cape.

These were also the favourite courses of the record-making pilots of the 'twenties and 'thirties, and almost all of them made use of the service. From 1928, realizing that the time had come to improve upon the *ad hoc* delivery methods which hitherto had sufficed, the company embarked upon a general policy of laying down bulk "dumps" and providing service crews to carry out the entire fuelling operations. Many local problems of storage and staff training had to be overcome, and always there remained transport difficulties that even to-day, in parts of Africa, may mean long successive journeys by rail, steamer, motor and even human transport before the fuel is finally in position. Mobile fuelling vehicles soon became standard equipment, and the chain of service stations for air transport spread over the Continent of Europe as well as much of Africa and the East.

Years before "briefing" became an accepted feature of flight-planning Shell Aviation Service prepared its own aviation maps and airfield data books. (The Battle of Norway was fought on such maps, which were the only air maps available to the R.A.F.). The Shell Carnet Card, for airline captains and private pilots alike, has proved, since its introduction in 1932, an almost universal "open sesame" for obtaining fuel and other supplies on credit.

When war came, the whole organization, with such personnel as were not called up, was placed at the disposal of the two Allies. In important war theatres Shell handled the fuelling of all aircraft except at the forward operational airfields. Often, at remote stations, their staffs had an unrivalled local knowledge, and this was fully utilized by the planners of transport and ferry services. Surveyed and stocked by the company in pre-war days, the so-called African Reinforcement Route (from the West Coast towns to Khartoum) proved of outstanding strategic value when the Mediterranean was closed.

Today: Shell service for a Venezuelan Skymaster at Maiquetia Airport, Caracas. The Thompson-Leyland Tyne tanker holds 4,000 gallons; this type (largest in the world) is also used by Shell at London Airport.

Within a few months of the end of the war, which had disrupted much of its organization, particularly in the Far East, a full revival of the service paved the way for the resumption, on a much wider scale than before, of the international airline network.

The sudden emergency of the Berlin Airlift in 1948-49, found Shell prepared to provide extra fuel and intensive service: over 14 million gallons of petroleum supplies were handled by the company at the Berlin terminus of Gatow alone.

The largest of the company's fuellers now so familiar to almost every air traveller is of 4,000 Imperial gallons' capacity, with a maximum rate of delivery of 400 gal/min—a far cry from the small "man-handled" cans of 1919 and earlier. The first of these big fuellers is now in operation at London Airport; another is in Venezuela.

With the advent of jet airliners such as the Comet, turbine fuel will be required instead of gasoline, and bulk stocks must be laid down along the Empire routes. In addition, the delivery crews must be trained in the use of special filtering systems and in the new technique of under-wing fuelling. When the first Comet flew from England to Cairo and East Africa in April-May last, over 71,000 gallons of a.t.f. and a considerable quantity of lubricants were made available for the one series of flights.

Yesterday: Shell facilities were well established in the East by 1924, when this photograph was taken at Calcutta, showing the Fokker C.IV in which Maj. Zanni, of the Argentine was attempting a global flight.

FLEXIBLE-TANK MAINTENANCE

INSTALLATION and maintenance manuals issued by makers of aircraft components are legion, and they vary from simple clipped-together sheets of duplicated matter to elaborately printed and illustrated pages secured by patent fasteners between covers stout enough to outlast the equipment to which they refer.

Quite one of the finest of these productions we have seen, judged from any point of view, is the new "*Flexelite*" *Flexible Tank Manual* recently issued by Marston Excelsior, Ltd., Wolverhampton. Illustrated by photographs and by large and clear cut-away drawings, and well indexed, it covers every aspect of its subject, starting with a brief historical review.

This "basic" publication is identified as Vol. I; there is also a Vol. II, applied to a series of manuals each referring to installations in specific aircraft.

CIVIL AVIATION

BEAUTY IN THE CLOUDS: An impressive glimpse of the first production Airspeed Ambassador, as it flew on a recent test-flight over Bournemouth Bay. The Corporation hopes to take delivery of the first of these aircraft shortly.

MORE extensive use is to be made of British turboprop-powered aircraft on B.E.A.'s regular services this year. To gain further operating experience, the Corporation intends to fly the prototype Viscount on scheduled services on the London-Paris and London-Edinburgh routes this summer. It will be recalled that the Viscount put in 120 hours on these routes last year.

As readers who saw our report (February 15th) of the lecture by Lord Douglas will be aware, two Dart-powered Dakotas will also be introduced this summer—on the Corporation's freight services. They will be flown by specially trained crews whose duty it will be to keep a technical eye on the Dart's performance. In this way B.E.A. hopes to accumulate at least 5,000 engine-hours under operational conditions.

The first Viscount 700 (the production version) has already flown over 100 hours since September, 1950. The first of B.E.A.'s fleet of 28 of these machines is due for delivery early next year.

B.O.A.C.'s FIRST COMET

ONE of the two D.H. Comets ordered by the Ministry of Supply will shortly be handed over to B.O.A.C., for operational and route trials including experimental flights between the United Kingdom and India. The first of these is expected to be between London and Cairo, *via* Rome, and will be made with the particular aim of giving communications and control staffs at these airports a first-hand knowledge of the Comet's operating requirements.

At some airfields, radio facilities will have to be improved. At Cairo, for example, it is understood that the Egyptian authorities are already tackling the problem. The Corporation hopes to take delivery of the first of the production Comets towards the end of the year. This machine will first be used for crew training.

Last year, incidentally, B.O.A.C.'s operating and traffic statistics showed that the total of revenue passenger-miles flown rose by 32 per cent to 542 million, as compared with 410 million in 1949. The total of passengers carried rose from 151,000 to 184,000.

TALKING OF RADIO AIDS

PROBLEMS concerning radio-navigation were reviewed at a recent meeting of the I.A.T.A. Radio Aids Group in Montreal. Approximately 35 representatives of airlines and radio manufacturers attended the conference.

Among the major subjects on the agenda was one dealing with the co-ordination of frequencies to be used for radio altimeters, airborne radar and other equipment, within the limitations of the new bands allocated by the International Telecommunications Union. The various standards for R/T. and navigation aids were also reviewed. Much of the work was actually done in preparation for the meeting of I.C.A.O's Communications Division, which is to take place on April 24th—also in Montreal.

Among the specific items dealt with at the I.A.T.A. meeting were considerations of communications problems concerning high altitude flights by jet aircraft; standardization of system characteristics for R/T. between air and ground; standard procedures for testing I.L.S. installations and standards for the use of D.M.E. as a navigation aid. In addition, the conference reviewed I.C.A.O. standards for I.L.S. on the basis of two years' experience, and also concerned itself with the evaluation of Decca as a short-distance navigation aid.

CONVERTIBLE SEATS FOR PAN-AMERICAN

ANNOUNCING the purchase of new Sleeperette seating equipment for the 18 DC-6Bs which they have on order, P.A.W.A. claim that the seats will incorporate new standards of safety and comfort.

They will be stressed at 10g, nearly twice the strength called for by the C.A.A. safety regulations. As an additional protective measure, a special shock-absorbing, sheet-metal "crash plate," designed to the approximate shape of the human body, will be built into the rear of each seat to increase the safety factor during forced landings. A new method of installing the seats on tracks will make it possible to convert the layout in a few hours to the varied requirements of de luxe Sleeperette, standard or low cost tourist flights.

CIVIL AVIATION'S SHARE

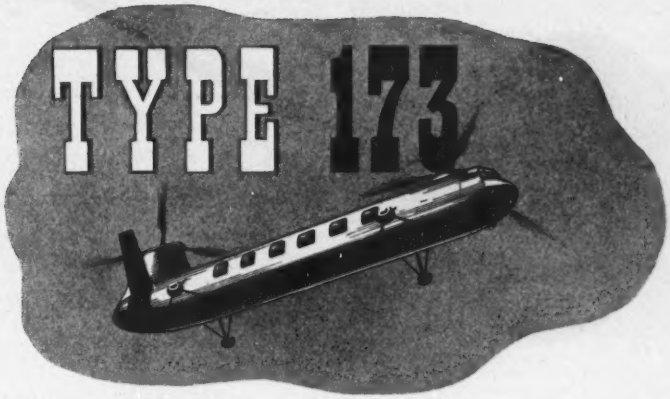
IN the course of the debates on the Air Estimates (see report on page 302), Mr. Arthur Henderson stated that aircraft of the civil Corporations and of the charter companies have been, and are being, chartered for a variety of tasks. During the last financial year some £250,000 was spent in this way. He said: "I think it can be regarded as money well spent, not only because of the value of the service received, but also because it has helped to maintain a valuable and considerable potential represented by the civil aviation industry. During the coming year additional use will be made of civil aircraft for the regular movement of troops."

He referred also to the formation of the first of the auxiliary transport squadrons "with the wholehearted co-operation of Airwork, Ltd.", and to the plan to form similar squadrons.

On another subject, also of great interest to civil aviation, Mr. Henderson said that the flying scholarships scheme had proved most successful. Seventy-seven cadets qualified for a Private Pilot's Licence at flying clubs in 1950, and 112 were under training when the year ended. The number of scholarships to be awarded in the next financial year was to be increased from 200 to 250.

THE AIR FRANCE FLEET

DURING the course of a recent French Cabinet meeting, the question of replacement aircraft for Air France came up for discussion. It was decided that contracts placed for a number of French-built airliners would be confirmed. The French aircraft industry will now be called on to supply 12 Bréguet 763 Deux-Ponts and eight S.E. 2010 Armagnacs for Air France's colonial routes. At the same time, permission was given for the ordering of ten L-1049 Super Constellations, which the company will put into service on transatlantic routes. The delivery of these machines will bring Air France's long-range fleet to 81 aircraft, of which 28 DC-4s and 19 L-749 Constellations are already in service; four additional L-749s are due for delivery this year.



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AN OPENING EXISTS FOR A JET AIRLINER

It is common knowledge that refuelling in flight has triumphed over the limitations of range and endurance for all current types of aircraft—jet fighters as well as piston-engined airliners and long-range bombers. The most spectacular instances of this triumph were last year's non-stop flight round the world by a Boeing B-50 of the United States Air Force, and the refuelling of a Meteor jet fighter which remained airborne for twelve hours. En-route refuelling has proved itself a fully practicable proposition on day and night airline schedules. The Flight Refuelling Service has all the experience and equipment necessary to ensure safe and efficient operation with the fastest jet airliners.

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CIVIL AVIATION NEWS . . .

As far as the company's European routes are concerned, the twin-engined S.O. 30P Bretagne is now being given route trials, but the number to be ordered has not yet been disclosed. Number 16 off the production line is shortly to be delivered to Air France for a 500-hour test, while Nos. 17 and 19—the first of the type to be equipped with Pratt and Whitney R-2800 CA-18 engines and Hamilton "paddle-blade" airscrews—are at present engaged on flight trials to test the cabin-heating and air-conditioning systems at high altitude.

Air France hopes also to be able to undertake trials, under commercial conditions, with the S.O. 30 which has been experimentally powered by two Hispano Suiza-built Nenes, and is due to begin flight tests in the near future.

FASHION FOR DAKOTAS

THE American internal company Delta Air Lines is now to follow the current fashion among Dakota-operators of increasing passenger-capacity and improving interior layouts. Delta will have a 25-passenger layout in their 18 DC-3s and will operate them at a gross landing weight of 25,200 lb.

The company is one of several U.S. airlines now faced with the difficult problem of replacing twin-engine equipment. Others in the same category who have not yet announced their plans are Capital Airlines (with 25 DC-3s and three Super DC-3s), Mid-Continent (with 20 DC-3s and four Convairliners), Chicago and Southern (12 DC-3s) and Northeast Airlines (eight DC-3s and five Convairliners). United Air Lines, who operate 58 DC-3s, began conversions to 28-passenger layouts last summer, but because of the Pacific air lift only two aircraft were completed.

THE CORPORATIONS IN NOVEMBER

RECENTLY published statistics for November, 1950, show that traffic carried by British airways corporations was again substantially greater than that for the corresponding period of 1949.

A total of 58,600 passengers—nearly 9,000 more than in the previous November—flew on the scheduled services of B.O.A.C. and B.E.A. (including B.E.A's associate operators). This increase was largely due to the greater number of passengers on international routes, which was over 42,000, as compared with 32,300 in November, 1949.

In all, some 57,000,000 passenger-miles were flown during the month—an increase of 28 per cent; freight ton-mileage increased by 21 per cent. The overall revenue load-factor achieved was 56.1 per cent, as compared with 54.8 per cent in November, 1949.

AERODROME OWNERS' ASSOCIATION

THE 24th annual general meeting of the Aerodrome Owners' Association took place at Londonderry House recently. Alderman A. H. Downs-Shaw (Bristol Corporation) took over the chairmanship of the Association from Mr. A. M. Desoutter (Airports, Ltd.). Mr. A. G. Douglas (British Air Transport, Ltd.) was elected vice-chairman, and four vacancies which arose out of automatic retirements on the executive committee have been filled by Mr. B. J. Hurren (Faireys), Mr. A. G. Douglas, Alderman Sir Herbert Hiles (Cardiff) and Alderman Mould-Graham (Newcastle-upon-Tyne).

S/L. A. W. Day.

The Association's former secretary, Mr. H. R. Gillman, who resigned to take up a post as director-general of the F.A.I. in Paris, is succeeded by S/L. A. W. Day, a well-known figure in both aviation and motoring circles. The new secretary is not lacking in aviation background; he saw service as a pilot during the First World War in France, Italy, Greece and the Near East. During World War II, and until 1947, S/L. Day was a senior air traffic control officer at operational stations of Bomber Command. He comes to A.O.A. from a senior post in the Ministry of Civil Aviation.

FLU-FIGHTER: When a K.L.M. Skymaster arrived in Sydney recently with suspected influenza contacts on board, all 66 passengers and crew were placed in quarantine and the airliner was immediately fumigated. This incident again exemplifies the extreme diligence of the world's airlines in meeting the requirements of international health authorities.

BREVITIES

AT a cost of £A700,000, the Australian Department of Civil Aviation is planning to provide a number of new airfields in Papua, New Guinea, before the end of this year. The airfields will be equipped with high-power, automatically controlled communication equipment.

* * *

United Air Lines will shortly open an office in Sydney, Australia, to serve as headquarters for sales and public relations activities in the Western Pacific area.

* * *

B.E.A. has announced its intention of enlisting 18 German stewardesses for German internal services. It is understood that they are being employed because few English stewardesses have sufficient knowledge of the language.

* * *

Development testing of the nosewheel landing-gear fitted to the new Piper Tri-pacer (illustrated in *Flight* of January 4th), included a touch-down on grass at 140 m.p.h. In all, some 4,000 landings and 3,000 miles of taxying—much of it over a particularly rough "obstacle course"—were accomplished during trials of the new undercarriage.

* * *

K.L.M. will shortly dispose of a number of L-749 Constellations; after they have been completely refurbished, two of them will be delivered to Capital Airlines. K.L.M. have ordered five L-1049Cs (due for delivery early in 1953). It seems, therefore, that for some time the company will be operating with a reduced Constellation fleet.

* * *

B.C.P.A. introduced new schedules on March 4th between Australia, New Zealand and North America; they have resulted in the fastest commercial services ever provided across the Pacific. Departing from Sydney at 11 a.m., aircraft will now reach San Francisco at 7 a.m. the following morning. Elapsed time for B.C.P.A's south-bound schedules has also been reduced by one hour.

* * *

The Director-General of I.A.T.A., Sir William Hildred, announced in Montreal last week that the volume of traffic which passed through I.A.T.A's Clearing House in London last year had

CIVIL AVIATION NEWS...

shown an increase of almost 10 per cent over the figure for 1949. This is taken as an indication of the satisfactory rate of expansion throughout the network of I.A.T.A's member airlines, who now account for 85 per cent of the world's international traffic. Actual transactions for 1950 totalled $147,682,000 (about £52,386,430), an increase of more than £4,000,000 on the 1949 results. During both years 84 per cent of the business was settled by offsetting credit and debit balances, thus enabling the complications of foreign-exchange dealings to be eliminated.

* * *

German enthusiasts have asked the West German Government to seek permission from the occupation authorities for the resumption of private flying, which has been completely banned in Germany since the war. This restriction was relaxed slightly in October, when Germans were permitted to charter civil aircraft under licence from the occupation authorities.

* * *

A useful new traffic-control device has been developed by Gilfillan Bros. Inc., of Los Angeles. Known as the automatic traffic control monitor, the unit is designed to keep a simultaneous track of three aircraft on final approaches. A meter-display in the cockpit of each aircraft records the position and approach-speed, and thus eliminates the need for a team of G.C.A. operators to relay verbal instructions.

* * *

Sixty-day excursion fares for services from Canada to the Caribbean, and also for flights between various points in the Caribbean area, are a feature of T.C.A's plans for the summer. This extended ticket-validity, and the fact that stop-over privileges are permitted at any point, will, it is hoped, encourage holiday travel. A thirty-day excursion fare is also being introduced between Canada and Bermuda.

* * *

When freight traffic warrants the provision of additional capacity, T.W.A. will in future use "Speedpak" baggage-panniers on Constellation services which travel eastwards from Shannon. The Speedpaks, which have been bought from K.L.M., have little effect on the Constellation's cruising speed, and range is reduced by only four per cent; the additional capacity provided is four tons. Eastern Airlines are thought to be the only other operator using Speedpaks.

* * *

At a recent international conference held in Constantinople, it was decided that Ellinikon Airport, at Athens, should be elevated to the status of a first-class airport. It was also proposed that Athens should be recognized as a regional flight-information and air-sea rescue centre for a zone which encompasses Crete and the major parts of the Ionian and Aegean Seas. In future, civil aircraft flying below 15,000ft within a radius of 400 km of the airport will come under the control of Ellinikon.

* * *

Two more fare concessions have been introduced by B.E.A. to reduce the cost of flying on British internal services. Students between the ages of 15 and 22 travelling between their homes and their places of study, may now have a return ticket at the single rate; this is actually an extension of the arrangement which existed hitherto for Continental services. The Corporation has also extended the scheme whereby a business firm spending more than £200 a year on B.E.A's internal routes will be granted a five per cent discount. If more than £1,000 is spent the discount will be 10 per cent.

* * *

Following a division of the functions of B.O.A.C.'s traffic handling unit, three new appointments have been made in the organization. Mr. A. R. Bennett has taken over control of the whole of the Corporation's sales branch, and his former post of sales superintendent (U.K.) is now the responsibility of Mr. M. D. Morrisey, formerly sales superintendent (Continental Europe). All traffic-handling duties at Airways Terminal are now the responsibility of Mr. G. R. Hawton, who is appointed manager, London traffic.

* * *

The Scottish Division of the M.C.A. will shortly move its headquarters to new Government offices at Sight Hill, Edinburgh.

* * *

The hearing of evidence at the public inquiry into the crash of a B.E.A. Viking at London Airport last October ended on March 7th. At the conclusion of the inquiry we intend to publish a summary of the proceedings.

* * *

In announcing details of military contracts undertaken by civil airlines, the American Air Transport Association reports that, during 1950, this traffic amounted to some $17,000,000, compared with $5,000,000 in 1949. Even within the United States, Army recruits are now being flown from reporting centres to their training bases.

* * *

Mr. Leslie Gamage, M.C., was recently elected chairman of the Joint Air Transport Committee of the Association of British Chambers of Commerce, the Federation of British Industries and the London Chamber of Commerce. He succeeds Mr. J. Vivian Holman, who together with Mr. J. S. Wills, was elected a deputy chairman for the coming year.

* * *

The total figures for aircraft movements at the Parisian airports of Orly and Le Bourget during 1950 were, respectively, 23,241 and 40,292; passenger movements at the two airports totalled almost 1,000,000. The figures for January, 1951, represent considerable increases over those for the corresponding month of 1950.

* * *

Avianca, the largest Colombian operator, carried more than 600,000 passengers in 1950, while freight traffic, at 95,000 tons, has risen by 29 per cent. The company recently bought two Constellations. The second largest airline in the country, Lansa, carried some 238,000 passengers and achieved a 66 per cent increase in the volume of freight carried, which amounted to over 40,000 tons. Lansa, incidentally, has applied for permission to open a route to Miami later this year.

* * *

Following discussions in London with the chief executive of B.E.A., the Lord Provost of Edinburgh, Sir Andrew Murray, returned to Scotland on March 2nd with an assurance that the Corporation would make a further examination of the Edinburgh-London services. These, it is understood, will in any case be stepped up to their full frequency on April 16th. As mentioned in *Flight* last week, Sir Andrew's visit followed a series of telegrams protesting against unsatisfactory planning of schedules between these two points.

CLUB AND GLIDING NEWS

ON May 26th the City and County of Newcastle-upon-Tyne are sponsoring an air display at the Municipal Airport at Woolsington. The event actually takes place on the Saturday before Newcastle's Festival of Britain celebrations; its organizers hope to present a first-class flying programme with events for R.A.F., Naval and civil aircraft.

ALTHOUGH bad weather hampered the flying activities of the Wolverhampton Aero Club considerably in February, members availed themselves of every flyable afternoon and the club's instructors were able to put in a satisfactory amount of time with cadets training under the A.T.C. Scholarship Scheme.

This year the club's "At Home" is being held on Saturday, May 26th, when the Wolverhampton club will also be responsible for the promotion of the Goodyear Trophy Race. In view of the large entry expected for this event, intending competitors are advised to forward their entry forms as quickly as possible.

Colour films of the Spanish and Deauville rallies proved an attraction during the evenings last month and arrangements are being made to hold several more film-shows in the near future.

The Wolverhampton Aero Club is located at the Municipal Airfield, Wolverhampton, and aspiring members may contact the club's secretary, Mr. L. E. T. Barley, at Fordhouses 2191 or 2228.

WITH the summer flying season approaching, many private pilots are no doubt wondering which Continental rallies they will be able to attend in 1951. Apart from the usual annual events, three other 1951 European rallies seem to warrant special mention.

The first, which will take place from May 5th-8th, is the International Air Rally of the Paris Trade Fair (mentioned in *Flight* of March 2nd). This event is open to all pilots flying aircraft of the "tourist" type whose individual engines do not exceed 450 h.p. It is not clear from the regulations how many British pilots may participate, but the Royal Aero Club will endeavour to get acceptance for all entries sent in before March 18th.

From June 15th-18th, the Royal Danish Aeroclub is holding its International Invitation Rally. Participation by foreign aircraft (private light machines only, whose pilots must be members of their own national aero club or its affiliates) will be limited to 100 entries (this figure includes pilots and passengers). Those taking part will be the guests of the Royal Danish Aeroclub and the three Danish flying clubs during their stay. The itinerary of the tour will take in the airports of Esbjerg, Odense and Skovlunde. The Danish Aeroclub is also drawing the attention of participants to a rally which is being organized by the Royal Netherlands Aero Club to take place immediately before the Danish event. Informa-

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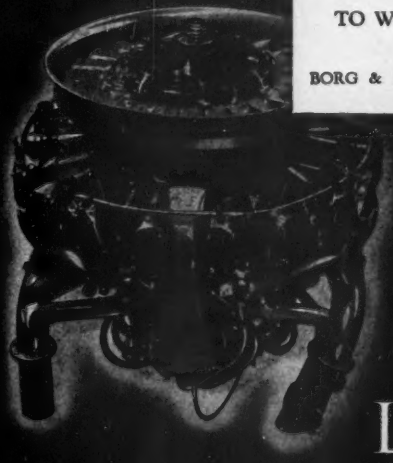

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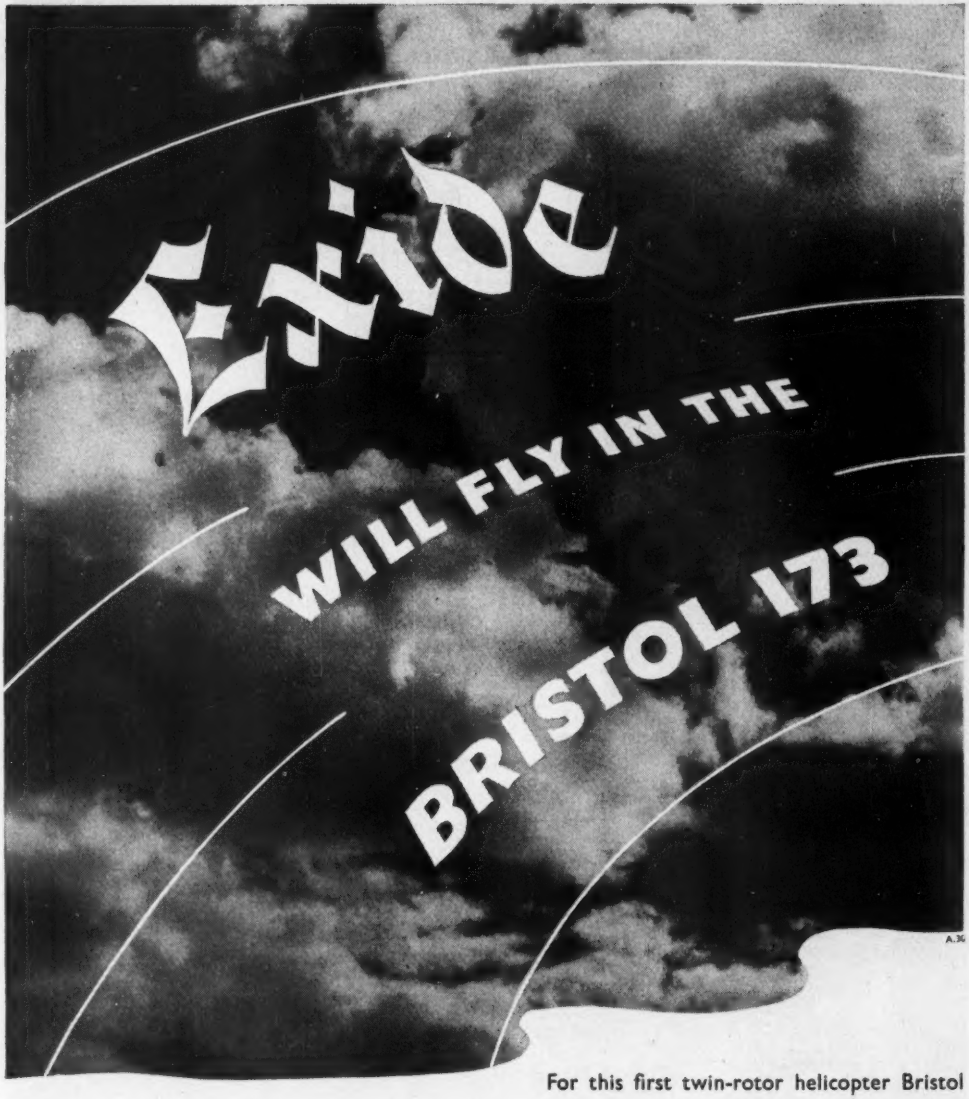

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Exide AIRCRAFT BATTERIES

CIVIL AVIATION NEWS . . .

tion about it may be obtained direct from the Royal Netherlands Aero Club.

The third major Continental gathering of the year is the International Air Circuit of Switzerland, to be held during the week-end of August 18th; details may be obtained from the Air Touring Department of the Royal Aero Club. The Aero Club of Switzerland, incidentally, is commemorating its 50th birthday on March 31st by an official celebration at Berne.

IN the current issue of *Gliding*, official journal of the British Gliding Association, appears an article written by a well-known gliding enthusiast under the pen-name of "Delta"; it is entitled "A Criticism of Soaring Contests." In view of the possibility that the 1952 International Soaring Contests may be held in this country, the subject is topical and some of the conclusions may be of interest to *Flight's* readers.

The article draws attention to the apparent lack of "aim and continuity of purpose" which seem to characterize British soaring contests. The result of this, the author claims, is the present absence of any British-designed-and-built competition sailplane, capable of challenging the German designs of the last decade. He suggests that the reason for this shortcoming lies in the constantly changing systems used for marking and handicapping.

The author considers that the aim of a gliding contest should be "to involve the greatest number of participants in the most exciting competitions possible, consistent with improving the breed of sailplane and the standard of flying." Suggested ways of meeting this aim are: (i) to evolve a national "restricted" or single design class; (ii) to adopt a rating system for sailplanes which would make possible handicapping on an equitable basis and, at the same time, encourage the most desirable types of sailplane to take part (such a suggestion, if once adopted, might be expected to remain in force for a number of years and so give glider manufacturers some basis for planning); (iii) to simplify the contests and include more "set tasks," which would have the desired effect of placing a premium upon piloting skill rather than merely proving the performance of an aircraft. (This would also reduce the cost and tedium of retrieving.)

It is suggested that the most economical form of contest, as well as the most exciting, might be a series of out-and-return flights, which, although returning to the same base, could nevertheless use different turning points each day. In the past, the Germans evolved a successful variation on this pattern in which the contests took the form of a tour of Germany, a different gliding site being the goal at the end of each day. In the course of a meeting visits were paid *en masse* to most of the important gliding sites and the competing sailplanes were seen by the largest possible number of people.

In future international contests it might be possible to include a race of this type between, for example, Dunstable and Madrid.

OWING to poor soaring conditions this winter, it is possible that the judges may not be able to award all the cash prizes for the Kemsley Winter Competition. If any prizes remain undistributed they will be awarded for the best flight (or flights) accomplished, by any method of launch, during March.

AN international soaring meeting is planned at Kufstein, in the Tyrol, from May 12th to 17th, 1951. The purpose of the meeting is to foster comradeship among sailplane pilots by joint flying activity. Those interested should communicate with the secretary of the British Gliding Association.

A SMALL party of R.A.F. Gliding and Soaring Association members, headed by the chairman, G/C. G. J. C. Paul, D.F.C., will be leaving later this month on a visit to France where, among other activities, they will investigate the "standing wave" phenomenon at St. Auban. A number of French national gliding centres are open to foreigners and various course dates are available. St. Auban sur Durance (Basses Alpes) is the centre for duration and altitude flights; Challes les Eaux (Savoie) specializes in blind flying training as well as duration and altitude flights; La Montagne Noir (70 km from Toulouse) concentrates on distance and blind flying and Pont St. Vincent, near Nice, is noted for distance flights (this club also receives *ab initio* pilots). Subscriptions, which are the same at each centre, vary from a two-day fee of Fr.2,100, giving at least one hour's soaring, to a fifteen-day subscription of Fr.21,000 which gives at least 10 hours' soaring. Winch launches are free; aero-tow launches are Fr.2,400 per towing-hour. Free lodging is provided and board—which varies at each centre—is available at a maximum of Fr.300 per day. All enquiries regarding these courses should be addressed to the Secretary-General of Civil and Commercial Aviation, S.A.L.S., 24, Boulevard Victor, Paris (XV).

AUSTER ABROAD: This Aiglet is one of several offshoots of the Auster family-tree used with great success by the Delhi Flying Club. Posed beside it is Mr. S. Sundra, Auster's Indian concessionaire.

AT the annual general meeting of the B.G.A., which is to be held tomorrow, March 17th, at Londonderry House, the chairman, Mr. Philip Wills, C.B.E., is expected to report that the past year has been a successful one in the field of gliding activity. Including the National Championships, but excluding the R.A.F. Gliding and Soaring Association, the A.T.C. and the B.A.F.O. Clubs, member-clubs of the B.G.A. flew a total of 7,560 hr with some 42,518 launches. Numbers of certificates and badges awarded by the Association during the year under review were as follows (1949 figures are in brackets): "A" certificates, 1604 (1,764); "B", 644 (493); "C", 242 (331); Silver Badges, 47 (67); and Gold Badges, two (three). The increase in "B" certificates has been due to the higher standard of A.T.C. training.

SQUADRON-LEADER E. J. FURLONG, of the London Gliding Club, has now taken delivery of his new Sky, which is the name Slingsby's have given to the high-performance machine previously known as the Gull V or the Slingsby 18m. The Sky is understood to have a better performance than the Weihe; it is hoped that this wholly British aircraft will take a prominent place in this year's contests. The London Gliding Club's totals for January were 269 launches with 146¾ hours. The Club has recently made a reciprocal arrangement with the Bristol Club for temporary day membership at 5s per day; flying charges are extra. Courses at Dunstable this year will be limited to members (including temporary members); scheduled dates are May 12th-27th, June 16th-July 1st and August 4th-19th. About 90 people attended the dinner and dance on February 17th to celebrate the 21st anniversary of the Club's formation.

FORTHCOMING EVENTS

Mar.	17.	Helicopter Association: "Convertible Aircraft," by Capt. R. N. Liptrot, C.B.E., B.A.
Mar.	17.	British Gliding Association: Annual General Meeting.
Mar.	17.	British Gliding Association: Annual General Meeting.
Mar.	17.	R.A.F. College, Cranwell: Rugby and Fencing v. Ecole de l'Air (home) and Hockey v. Royal Naval College, Greenwich (away).
Mar.	17.	British Interplanetary Society: Film Show, Central Technical College, Birmingham.
Mar.	24.	British Interplanetary Society: Film Show, Science Museum, London.
Mar.	29.	R.Ae.S.: "Modern Naval Aircraft Design," by D. L. Hollis Williams, B.Sc., F.R.Ae.S.
Mar.	31.	Army v. R.A.F. Rugby, Twickenham.
Mar.	31.	R.A.F. College, Cranwell: Hockey v. R.M.A. Sandhurst (away).
Apr.	6-10.	Physical Society: Exhibition, Imperial College, South Kensington, London, S.W.7.
Apr.	7.	British Interplanetary Society: "Evolution of Life in the Universe," by Prof. J. D. Bernal, F.R.S.
Apr.	12.	R.Ae.S.: "Comet Planning and Production Methods," by H. Povey, A.F.R.Ae.S.
Apr.	13.	College of Aeronautics, Cranfield: Senior Common Room Society's Annual Dinner.
May	6.	R.Ae.S.: Garden Party, White Waltham.
June	15-	
July	1.	Paris Aero Show.

CORRESPONDENCE

The Editor of "Flight" does not hold himself responsible for the views expressed by correspondents in these columns. The names and addresses of the writers, not necessarily for publication, must in all cases accompany letters.

Each-way-facing Seats

THE current interest in rearward-facing seats for commercial airliners prompts me to suggest a way of overcoming the "rearward-facing phobia" of some passengers during the main part of the flight.

If each seat were fixed to withstand the proposed 20g force, the back-rest part could be pivoted to swing backwards and forwards (as in some tramcars) so that during take-offs and landings, passengers would sit facing to the rear of the aircraft. When level flight was reached, and the steward's blessing given, they could swing over their back-rests and face forwards. In either forward or backward position, the back-rests would be locked to prevent involuntary movement.

May I add that either-way facing seats would also be useful if passengers wished to converse or play cards?

Birmingham, 2. PETER F. WRIGHT.

Stall Warning

ON page 280 of *Flight* for March 9th a description is given of a simple stall-warning device, the action of which is based on the effect of dynamic air pressure on a "pressure-plate." I feel that it should be pointed out that devices of this kind—the common, fallacious A.S.I. included—may be potentially dangerous so far as stall-warning is concerned.

The stall of an aerofoil depends solely upon its angle of incidence, and not upon the velocity of flight. Most stalling and spinning incidents happen when the critical incidence is inadvertently exceeded during a turn—for instance, when turning in for the approach-glide to land. In a turn, the stalling speed is substantially higher than that in straight flight, and a device dependent on dynamic air pressure would not register a warning.

A stall-warning indicator must either be related to the aerodynamic incidence of the wing, i.e., must refer to the direction of the undisturbed airflow ("wind-vane" type) or to the change in airflow over the wing (which is the origin of the stalling phenomena).

Dunstable, Beds. A. R. WEYL, A.F.R.Ae.S.

Airspeed Designations

I GREET with much approval the "new-look" *Flight*. The new style makes for much easier reading, and provides far better presentation of photographs.

However, my real reason of writing is to make some comments on the very useful Airspeed article (February 23rd), particularly as regards the Oxford. In the descriptive paragraphs on the Oxford you quote various mark numbers which were generally accepted during the War and thereafter. However, I should like to quote the following, to which I am indebted to the Airspeed Company.

"Airspeed AS.10 Oxford Marks 3 and 4 were both projects. The Mk 3 reached the mock-up stage. It was designed to use the Cheetah 15 engine, and to carry increased equipment in order to take advantage of the increased power, and at the same time rearranged to take advantage of the forward movement of the c.g., caused by the use of heavier engines. The mock-up included an improved view for the pilots; easier access to the pilots' seats and redesigned instrument-panel lighting; a modernized electrical supply panel; a re-arranged cabin, with more legroom attainable by deleting the bomb-bay; W/T. position with installations immediately behind the pilot; and navigator's position with chart board, drift recorder, etc., at the rear of the cabin. The type was to be used as a navigational trainer. The Mk 4 was to have been a pilot-training version of the Mk 3."

From the above you will observe differences from your text. Actually, the Oxford with Cheetah 15 engines (P.1864—a photograph of which appears on page 225, captioned wrongly as a Mk 5) was an Oxford Mk 2 experimental, being a testbed for the Mk 3 engine installation. Similarly, the Gipsy-Queen-engined version (AS.504) was an Oxford Mk 2 experimental.

On checking further, I see on page 228 that part of what I say above is borne out. However, you list the Cheetah 15 version as being a Mk 2 experimental, but list the same machine again as Mk 3! It is all, I am afraid, a little confusing.

Whilst still on the subject of Oxfords, I was delighted to see the photograph of the twin-fin Oxford. I have made exhaustive enquiries for photographs of this machine, but have had no success.

To go a little deeper, this time into the Ambassador's history, it may be of interest to note that the design number AS.14 had two variations as follows: 14A Ambassador project: twin fins and rudders; retractable tricycle undercarriage; two 920 h.p. Bristol Pegasus 10c. 14B Ambassador project: single fin and rudder; retractable tailwheel undercarriage; two 920 h.p. Bristol Pegasus 10c. A mock-up of the AS.14B was built.

Finally, I should like to say how much I appreciate these "history" articles, as they always provide that extra bit of information for which one is looking.

Grimsby, Lincs. P. H. T. GREEN.

[The Airspeed Company writes: "One of the curious things about any form of recorded history is that it can never, never be entirely correct. Memories are faulty and records are misleading when taken from their contexts. The late Mr. George Orwell showed us, in his *Nineteen-Eighty-Four*, how records could even be deliberately falsified by ingenious people.

"We can take some of the blame for the minor, but certainly not deliberate, errors which have somehow crept into the Airspeed type descriptions and designation list, since we provided much of the information and checked the original form of the list.

"We failed, for instance, to spot the mention of Cheetah IXs in relation to the Oxford series. In fact, no Oxford was fitted with this mark of Cheetah, which, unlike the Cheetah X, had no hydraulic pump. The Oxford III proper never got beyond the project stage, but, as its main feature was the use of Cheetah XV engines and constant-speed airscrews, the version of the Oxford II, so experimentally equipped, tended later to be referred to as the Mark III type; hence the nominal error. In the text on page 225 the Oxford IV (which was a projected crew-training version of the Oxford III) has somehow got itself fitted with Gipsy Six engines, and the caption, at the foot of the same page, describes the Oxford II with Cheetah XVs and Rotol airscrews as a Wasp-engined Oxford V.

"Your correspondent's suggestion that there was a tricycle undercarriage version of the AS-14 cannot be confirmed by any of the members of the staff who were then with the firm. It seems, on the face of it, to be unlikely, since the tricycle idea was not, at that time, seen even as a proverbial glint in any designer's eye."]

Early Days of Aircraft Radio

FROM your report of the Ninth Brancker Memorial Lecture, I was disappointed to see that Mr. Masefield's valuable references to the history of civil aviation development included no details of the parallel development of wireless communication and navigational aids without which there could have been no civil aviation as we know it today.

I had the good fortune to live through some of those early years as an Air Ministry wireless officer at the Croydon airport, and I think it must always stand to the great credit of the Marconi Company that their faith in the future of civil aviation, in its dependence upon wireless aids and in their ability to develop those aids was so strong that they were "in" from the very start at Cricklewood and Hounslow and went doggedly on as civil aviation flickered into and out of existence.

Experimenting and developing, scrapping and replacing, installing and servicing, bonding and screening—the first company to possess its own experimental aircraft—here was private enterprise at its best, for their reward could have been nothing but loss.

The full story would warrant a lecture of its own, but those famous pioneers so deservedly named by Mr. Masefield are incomplete without such additions as J. M. Furnival, H. C. Van de Velde, A. W. Whistlecroft, H. T. Sayer, and C. J. Strother, all of the Marconi Company and some, I believe, still in high office with them today. F. S. Mockford, who was in charge of the Air Ministry wireless services at Croydon in my day and had started at Hounslow in 1919, is now commercial manager of the Marconi Company. L. A. Sweny, now the company's Aeronautical Division manager, was with us, too, but even earlier was with that very first airline, Aircraft Transport and Travel, Ltd. Another "Airco" wireless man was B. N. MacLarty, now deputy engineer-in-chief of Marconi's.

Pioneering by a Ministry is less credit-worthy, for it is not their own money they hazard, but let us not forget the work of the Air Ministry Signals Branch and, in particular, of their first "visionary," Noel Hamilton. Let us remember the world's first civil aviation radio station specially designed for the purpose to the Air Ministry's requirements by P. P. Eckersley, then of the Marconi Company, but later to become famous as the B.B.C.'s chief engineer.

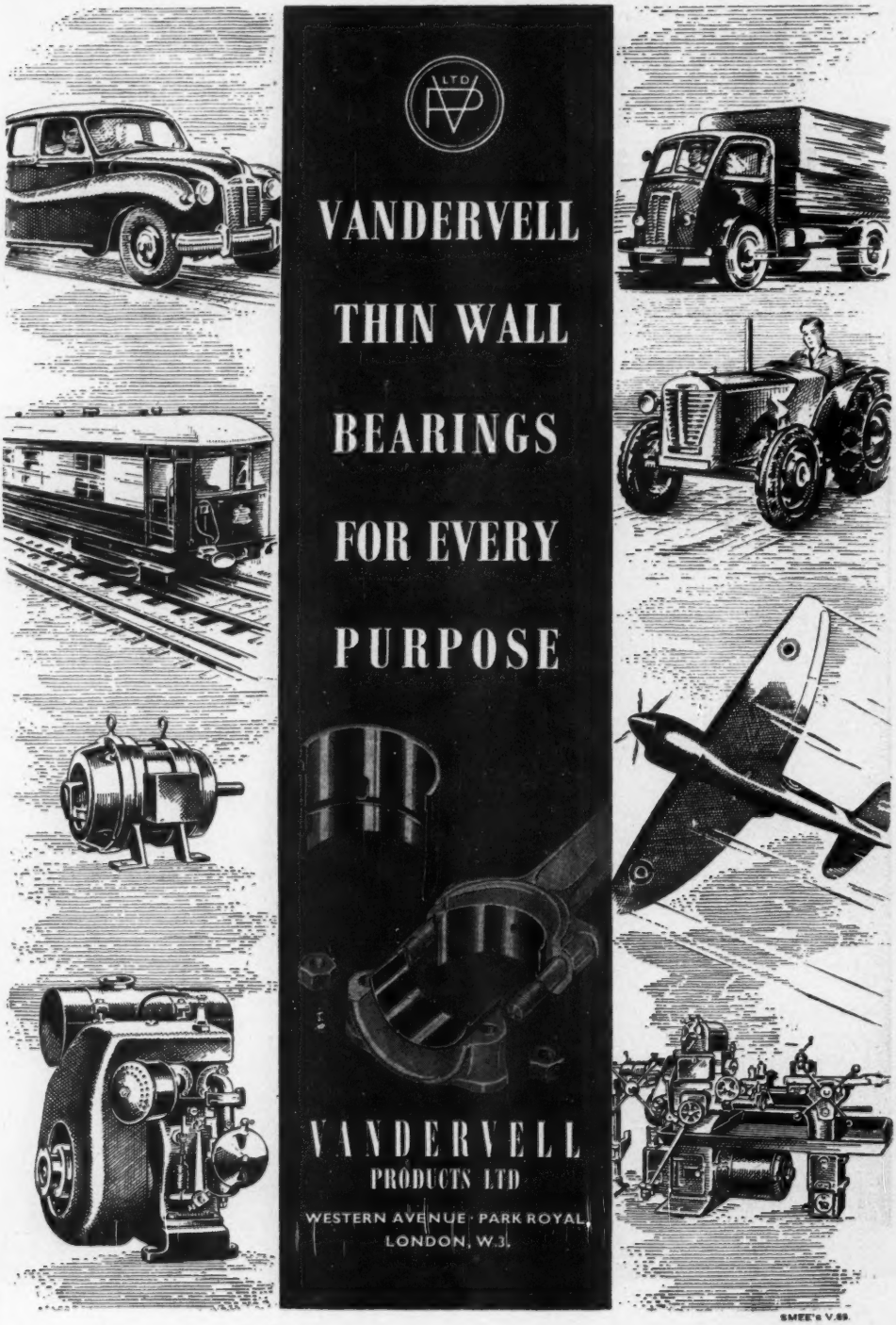
Sudbury, Suffolk. A. J. K. JANAWAY.

MESSIER

Landing Gear on the

Bristol

TYPE 173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SERVICE AVIATION

Royal Air Force and Naval Aviation News

SLEEK AND SWIFT: A new view of the Supermarine 535, which may well be the forerunner of an even more advanced design for R.A.F. fighter squadrons. Its power-unit is a Rolls-Royce Nene with afterburner, but the more powerful Avon could be installed.

THE first R.A.F. officer to be appointed to the H.Q. staff in Paris of General Eisenhower, Supreme Allied Commander, Europe, is A.V-M. Edmund Hudleston, C.B., C.B.E., who will be Deputy Chief of Staff, Plans. Until recently, he has been A.O.C. No. 1 Group, Bomber Command; he was appointed acting Air Vice-Marshal on May 5th, 1948.

A.V-M. Hudleston, who is only 42, was born in Perth, Western Australia, and was commissioned from the R.A.F. College, Cranwell, in December, 1928. His war service was spent overseas. After two years on attachment to the Turkish Government, he was appointed to R.A.F. Middle East H.Q. in May, 1941. As a member of Mediterranean Air H.Q. in 1943, he helped to plan the Sicilian campaign; soon afterwards he became S.A.S.O. to No. 1 Tactical Air Force, with which he served in Sicily and Italy until 1944. His last wartime operational command was in N.W. Europe —as A.O.C. No. 84 Group, Second T.A.F.

A.V-M. E. C. HUDLESTON, whose appointment to General Eisenhower's staff in Paris is reported in the adjacent column.

Arctic Flights from Shawbury

FOUR Lancasters from the R.A.F. Central Navigation and Control School, Shawbury, are making the first high-latitude, navigational-training flights from the School for two years. After arriving at Keflavik, Iceland, by Sunday, March 11th, the aircraft were due to make two 2,000-mile training flights before returning to base on Saturday, March 17th.

The Lancasters' aircrews—students on a specialist navigation course at Shawbury —are equipped with the new heavy flying clothing for cold climates. The aircraft carry survival equipment and their own ground crews, who wear duffle coats, leather jerkins, Wellingtons and heavy stockings. Commander of the mission is G/C. B. J. R. Roberts, Commandant of the Central Navigation School; his deputy is S/L. J. S. Sherwood, D.S.O., D.F.C.

An R.A.F. Sabre-pilot

FROM the U.S.A.F. comes an interesting note on one of the first R.A.F. fighter pilots to be assigned to the American Far East Air Force for combat duties over Korea—F/L. Stephen Daniel, D.S.O., D.F.C., a "tall, sandy-haired Scotsman from Dumfriesshire." Formerly a Meteor pilot at Tangmere, F/L. Daniel was posted to the 1st Fighter-Intercepter Wing in the U.S.A. for two years' exchange duty. He has since transferred to Korea and now flies F-86A Sabres with the 4th Fighter-Intercepter Wing.

Daniel describes his first trip to the Orient as an enjoyable and fascinating experience, and adds that he hopes to "get a crack at the Migs soon."

His wartime R.A.F. career, which began in 1941, included the command of two squadrons—Nos. 72 and 145. Operating from Britain and in the Mediterranean theatre, F/L. Daniel destroyed 15 enemy aircraft.

Activity in Malaya

A LOW-FLYING Lincoln of Far East Air Force last week attacked bandits besieging an isolated police-station in east Johore. The post came under fire while a Dragonfly helicopter-ambulance was on its way to evacuate four casualties. The Dragonfly returned to Johore Bahru with its escorting Auster and the Lincoln shelled and machine-gunned the jungle until the bandits had vanished, permitting the evacuation to take place.

The decisiveness of this engagement was in contrast to the normal operations by the R.A.F. in the Malayan campaign, the history and progress of which were the subject of a lecture by A.V-M. Sir Frank Mellerah, K.B.E., A.F.C., at the Royal

COMING ABOARD: The versatility of the helicopter is being fully exploited by the Navy. Here, a Westland-Sikorsky Dragonfly, carrying dispatches from the carrier "Indomitable," is seen about to land on H.M.S. "Vanguard" during the recent spring cruise of the Home Fleet. The battleship's quarterdeck awning was spread, so the Dragonfly touched down between the anchor-cables—creating, it is thought, a Naval precedent.

SERVICE AVIATION . . .

United Service Institution on March 8th. Until recently, Sir Frank was A.O.C. Malaya, an appointment now held by A.V-M. R. S. Blucke, C.B., C.B.E., D.S.O., A.F.C.

The lecturer outlined events since 1941, when British officers were training a corps of agents for employment against the Japanese when they came. In 1945 an attempt was made to disarm this body; some 6,000 complied and the remainder carried on in the Malayan Communist Party.

After describing the early attempts by civil authorities to put down the insurrection, Sir Frank gave details of the part now being played by the R.A.F. (This was dealt with at length in our issue of January 18th, 1951.) Giving some specific figures, A.V-M. Mellersh told his audience that in more than 4,000 supply drops to the troops fighting in the jungle over 6,000,000 lb. of stores had been delivered with only 1½ per cent failure.

At the end of the lecture a film was shown depicting the work of the R.A.F. in Malaya. Many of the shots in this were excellent in all but their photographic quality.

The chair was taken by Air Marshal Sir Hugh P. Lloyd, K.B.E., C.B., M.C., D.F.C., A.O.C.-in-C. Bomber Command.

Naval Retirement

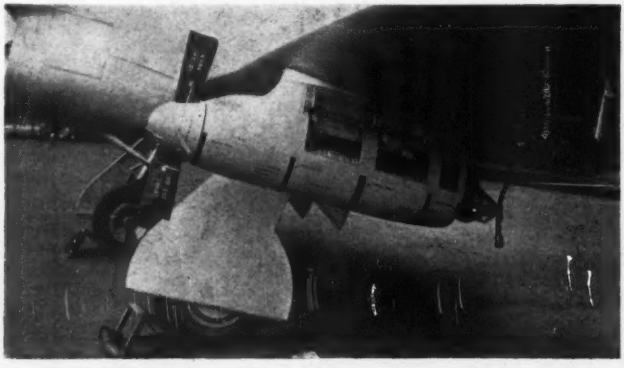
AFTER 44 years' service with the Royal Navy, much of it concerned with aviation, Admiral Sir Reginald H. Portal, K.C.B., D.S.C., relinquished the post of Flag Officer Air (Home) on March 8th. In this post, which he took up in November, 1947, Sir Reginald has been succeeded by Vice-Admiral Charles E. Lambe, C.B., C.V.O.

Admiral Portal volunteered for duties as an observer in 1916, and within six months had been awarded the D.S.C. for gallantry in combat off the Dardanelles. After the war—from 1923-25—he was seconded to the R.A.F. for pilot-training, and eventually left front-line Naval flying with the ranks of Commander, R.N., and Honorary Squadron Leader. As Deputy Director of the Naval Air Division, and of Air Matériel, in the immediate pre-war years, Sir Reginald helped to prepare the Fleet Air Arm for action. He resumed his connection with aviation in 1943 as the first Assistant Chief of Naval Staff (Air), after spending periods at sea in command of H.M. Ships *York* and *Royal Sovereign*. From December, 1944, until the end of the Japanese War, he commanded Naval Air Stations (Pacific) and directed Pacific Fleet operations against Okinawa and the Japanese mainland.

AT CAMBRIDGE: Groups of hosts and guests at the recent annual dinner of the Cambridge University Air Squadron. (Top left) W/C. K. C. Doran, W/C. A. N. Willan and W/C. C. N. Foxly Norris; (top right) W/C. C. H. Simpson, G/C. Viscount Acheson and W/C. F. W. Wiseman-Clarke; (lower left) W/C. A. V. Rogers, G/C. C. J. Mount and W/C. P. C. Hilton; (lower right) Mr. S. C. Roberts, Vice-Chancellor, Air Marshal C. W. Weedon and Air Marshal Sir Robert Foster.

R.A.F. Appointments

THE Air Ministry announces the appointment, effective from March 19th, of A.V-M. Gerard Combe, C.B., as Air Officer in Charge of Administration, Maintenance Command. Until recently, A.V-M. Combe was President of the Ordnance Board, Ministry of Supply, a post filled in rotation by senior officers of the three Services. He succeeds A.V-M. C. N. H. Bilney, C.B., C.B.E., who takes up a new appointment on March 26th as Director-General of Technical Services (1) at the Air Ministry.



DROGUE-DRAGGER: In place of the port drop-tank, this Hawker Tempest T.T. Mk. V target-tower (Napier Sabre) carries a nacelle housing a wind-driven winch and towing-gear.

A.T.C. Gliding in 1950

ALTHOUGH severely handicapped by bad weather, Air Training Corps gliding schools carried out a total of 105,614 launches and trained 1,474 cadets to the international "A" certificate standard during 1950. Of these cadets, 252 received additional training and qualified for the "B" certificate, and three cadets qualified for the "C" certificate.

During the year the Instructor School carried out 5,682 launches, flew a total of 673 hours 31 minutes, and passed out 304 students. The best results from an A.T.C. School were 72 "A" certificates and 15 "B" certificates for 5,307 launches by No. 89 Gliding School at Christchurch, Hants.

Naval Display in the North

SATURDAY, June 2nd, has been fixed as the date for this year's Naval Air Day at R.N.A.S., Anthorn, near Carlisle. A full-scale flying programme, which will include almost every type of modern Naval aircraft, should ensure the success of the event, which is the only Naval air display to be held this year in the north of England.

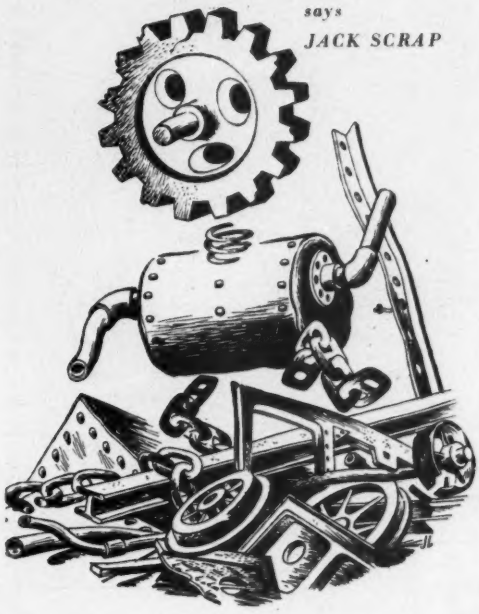
New Auxiliary Commanders

APPOINTMENTS are announced of new commanding officers for three fighter squadrons of the R.Aux.A.F. S/L. P. J. Anson, D.F.C., who now commands No. 603 (City of Edinburgh) Squadron, based at Turnhouse, enlisted in the R.A.F.V.R. for pilot training in 1940. He is a Regular officer and spent a period in 1949 as acting adjutant of No. 603 (Warwickshire) Squadron.

Another Scots Auxiliary squadron now commanded by a regular officer is No. 612 (County of Aberdeen), located at Dyce. Its new C.O. is S/L. G. W. Cory, A.F.C., who joined the R.A.F. in 1938. The third new squadron-commander, also a Regular, is S/L. H. R. P. Pertwee, D.F.C., who has taken over No. 611 (West Lancs) Squadron at Woodvale.

'Get me out of this dump'

says
JACK SCRAP



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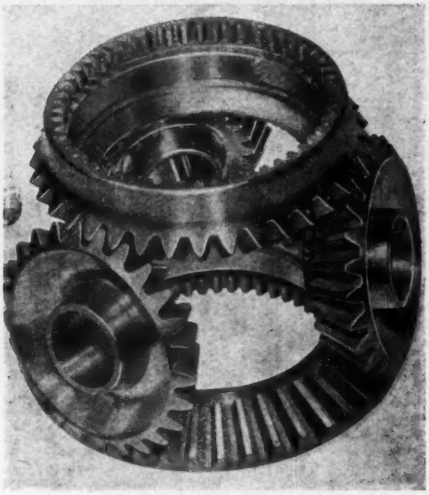

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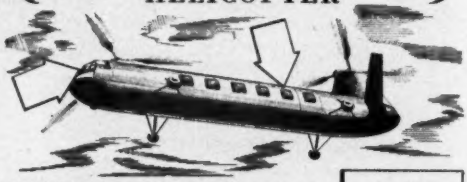

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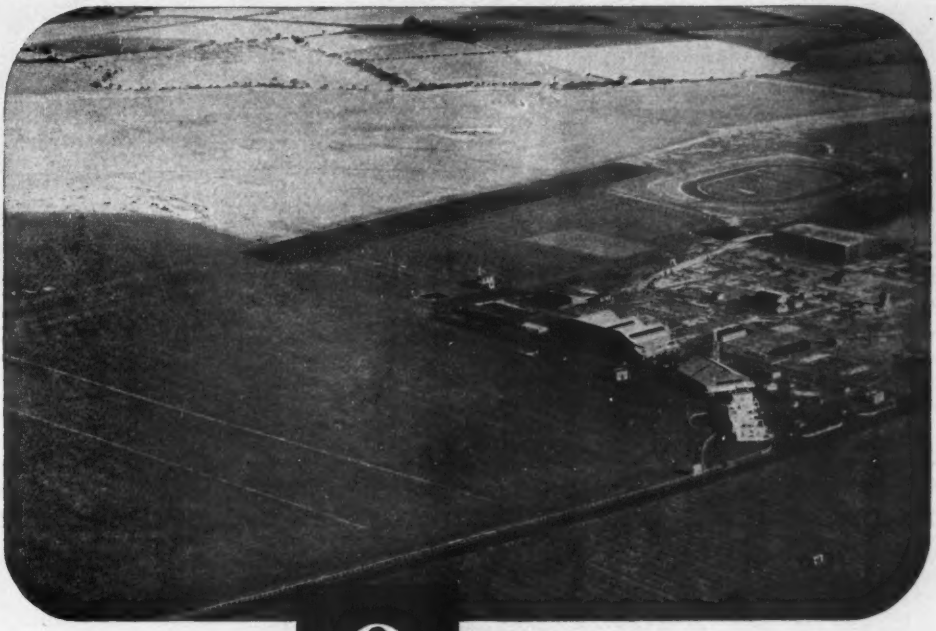

8

Recognize this airfield? It's No. 8 in this series of puzzle photographs. You'll find the answer below on the right.★

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For the Bristol 173

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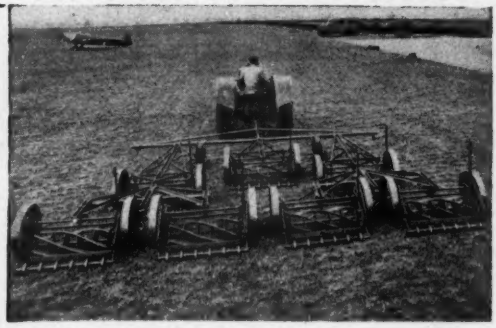

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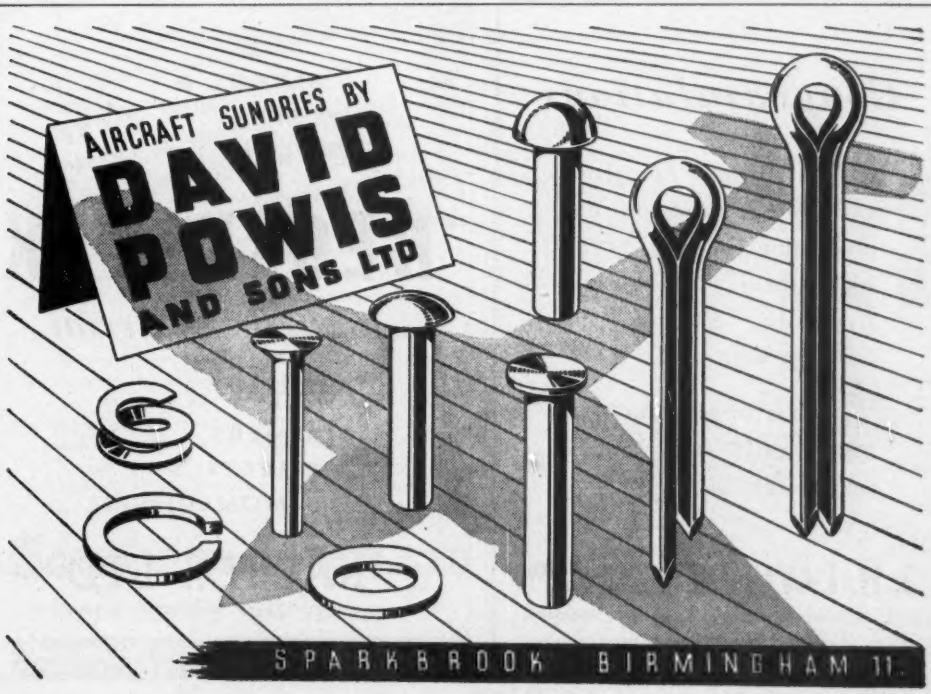

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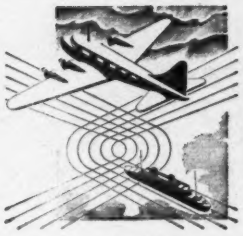

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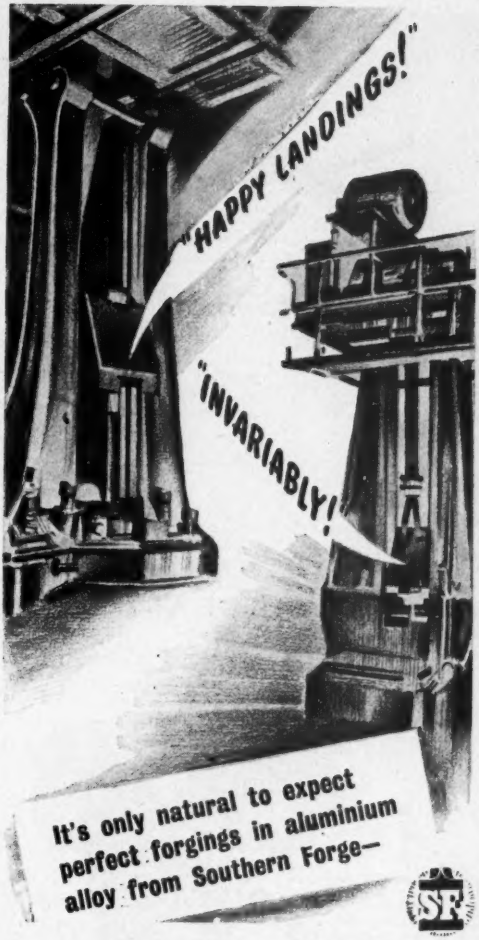

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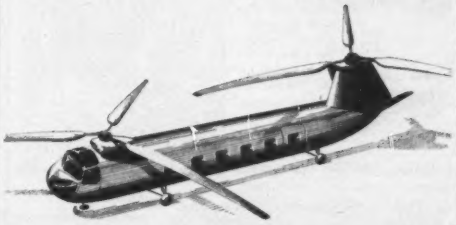

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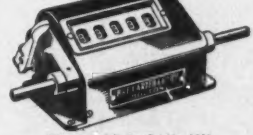
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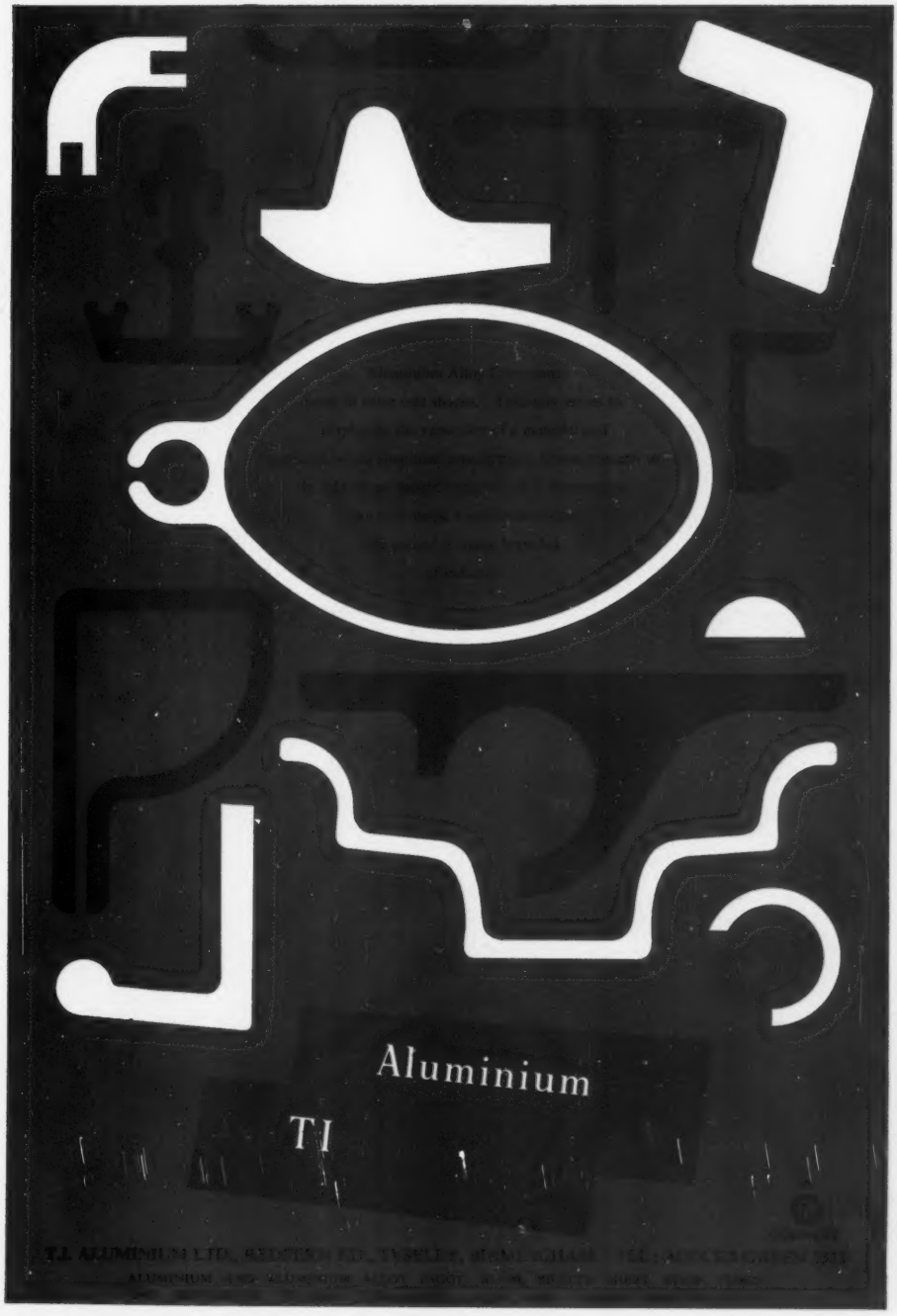
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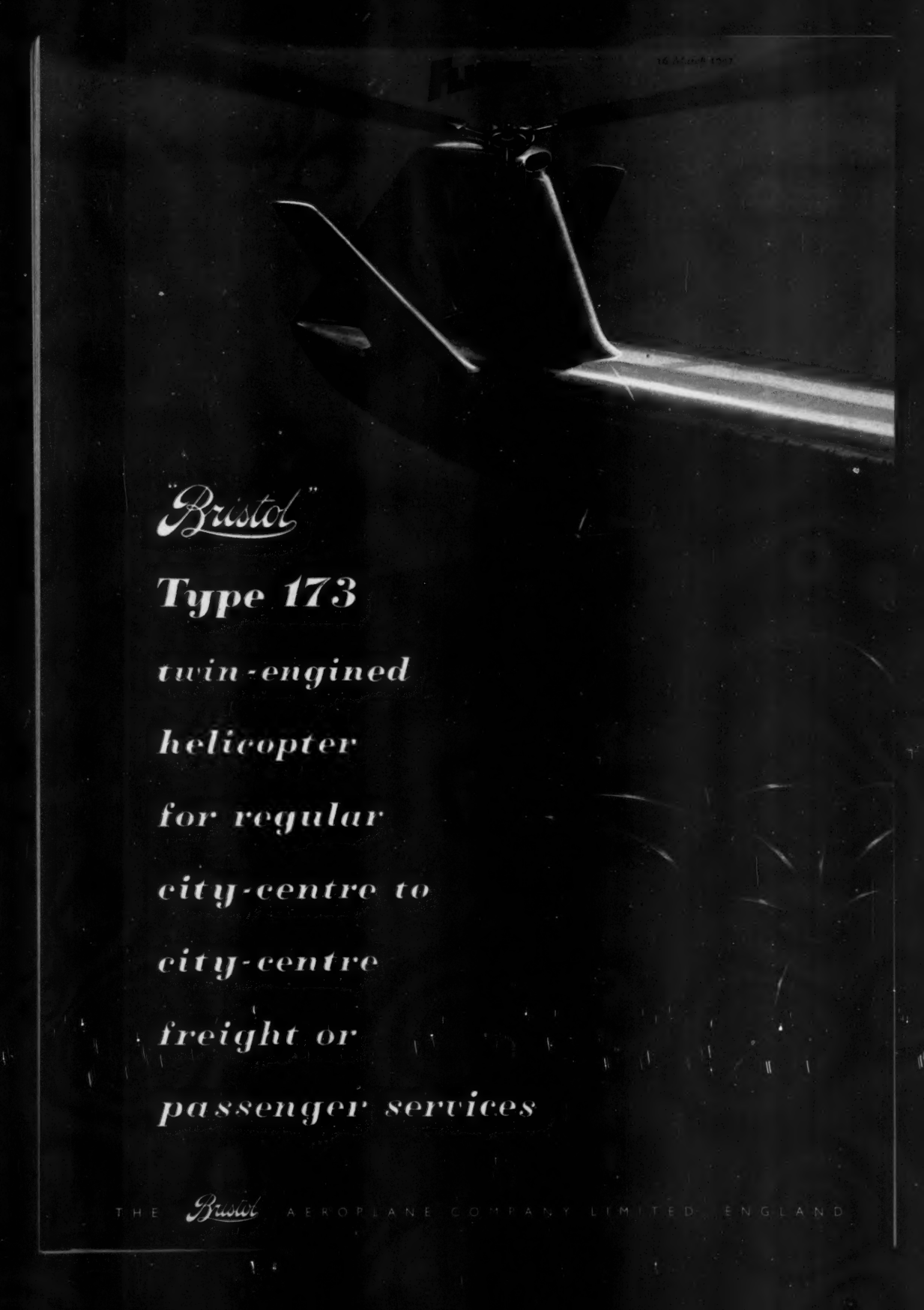
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